University of Alberta

Integrating Standardized Management Systems – A Generic Model and Supporting Methodologies for Implementation and Auditing.

by

Miguel Rocha Romero ©

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the

requirements for the degree of *Doctor of Philosophy*

Department of *Mechanical Engineering*

Edmonton, Alberta

Spring 2006

Library and
Archives Canada

Published Heritage
Branch

395 Wellington Street
Ottawa ON K1A 0N4
Canada

Bibliothèque et
Archives Canada

Direction du
Patrimoine de l'édition

395, rue Wellington
Ottawa ON K1A 0N4
Canada

Your file Votre référence
ISBN: 0-494-14032-1
Our file Notre référence
ISBN: 0-494-14032-1

NOTICE:
The author has granted a non-exclusive license allowing Library and Archives Canada to reproduce, publish, archive, preserve, conserve, communicate to the public by telecommunication or on the Internet, loan, distribute and sell theses worldwide, for commercial or non-commercial purposes, in microform, paper, electronic and/or any other formats.

The author retains copyright ownership and moral rights in this thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without the author's permission.

AVIS:
L'auteur a accordé une licence non exclusive permettant à la Bibliothèque et Archives Canada de reproduire, publier, archiver, sauvegarder, conserver, transmettre au public par télécommunication ou par l'Internet, prêter, distribuer et vendre des thèses partout dans le monde, à des fins commerciales ou autres, sur support microforme, papier, électronique et/ou autres formats.

L'auteur conserve la propriété du droit d'auteur et des droits moraux qui protège cette thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

In compliance with the Canadian Privacy Act some supporting forms may have been removed from this thesis.

While these forms may be included in the document page count, their removal does not represent any loss of content from the thesis.

Conformément à la loi canadienne sur la protection de la vie privée, quelques formulaires secondaires ont été enlevés de cette thèse.

Bien que ces formulaires aient inclus dans la pagination, il n'y aura aucun contenu manquant.

Canada

Abstract

Implementation of Management Systems (MSs) in accordance with standards, such as ISO 9001 for quality or ISO 14001 for environmental management, is usually done with minimum considerations for the underlying organizational structure. As a consequence, organizations often develop MSs that suffer not only from isolation, but also from conflict of interest and lack of achievement of the very objectives that initially led to their implementation. Based on an extensive literature review, this research first identifies the need for a conceptual structure to integrate isolated MSs, including a model for the integration of selected Management System Standard (MSS) requirements and a supporting methodology to enable such integration.

Subsequently, a comprehensive Integrated Management System (IMS) framework is developed, encompassing:

1. A generic (IMS) model that facilitates the integration of four standardized MSs: Quality (QMS), Environment (EMS), Occupational Health & Safety (OHSMS) and Corporate Social Responsibility (CSRMS).
2. A flexible implementation methodology for acquiring an IMS at two different levels of performance: standardized-requirement level (S-IMS) and excellence-requirement level (E-IMS).
3. A set of guidelines for auditing the IMS with the aim of enhancing its performance.

A number of concepts and techniques were applied in an innovative fashion to support the design of this IMS framework. The concepts applied included the QFD technique to determine the requirements of IMS stakeholders, a modular scheme for the IMS implementation methodology which can be used regardless of the starting and finishing points or sequences of integration, and a verification process using a group of Canadian quality experts involved with the development of standards at both the national and international levels. To validate the IMS framework in different organizational contexts and sequences of integration, two IMS implementation processes were simulated using information obtained from two Canadian companies.

It is concluded that the IMS framework conceptualized in this thesis provides a comprehensive guideline for the integration of standardized MSs. Major contributions are generated to support Canadian and international work on integration of standardized MSs as well as the development, implementation, evaluation and improvement of MSSs. However, some IMS requirements, such as the duration of the implementation cycle and a performance measurement system can be improved by further research.

ACKNOWLEDGMENTS

Over the last four years I have spent in Canada I have come to realize that a project such as a PhD degree is not possible without the support of many people. I would like to take this opportunity to thank all of them for their support, encouragement and in general, their friendship that has helped me to achieve this dream. I hope to continue this chain by being someone else's support and friend.

I guess one of the most difficult problems I faced when coming to Canada was to be far from my family. They were, are and always be an essential part of my life. During my whole life they have always supported my decisions, encouraging me to follow my dreams and work hard for them. Even from afar they have always been with me, suffering when times were bad and enjoying when times were good. To my Mom, my Dad, Ruben, Geno and Sergio, thank you so much for all your love and support… This is for you as well!

Thanks Stan for all your time and effort. During the last four years you have been a really good friend and mentor. You knew the difficulties and the challenges that I faced as an international student, demonstrating great patience in my development as a researcher and especially as a writer. I hope we can maintain this relationship in the future now as colleagues.

As part of the AIMS lab I would like to thank also to the members of the 'gang'. To Imran, Kosta, Susan, Polo, and Cory. Thank you guys for your friendship that help me in school and beyond. It was always good to come to the lab although I recognize sometimes we hardly worked there! Hopefully, the guys next door won't complain again for all our noise and laughs!

To CONACYT for sponsoring my studies. Before knowing CONACYT provides scholarships for doctoral studies I never dreamed to go to another country to study. So, many thanks for this wonderful opportunity. I hope to contribute in my own way to the development of Mexico. Mexico has a huge potential still to be discovered and developed. I just hope to be part of such discovery and construction.

Thanks to my dear friend Alicia. You have always been an awesome friend. I still don't understand how we are friends, being so different. But you have always been truly a friend and an inspiration to me.

Thanks to all my friends from Mexico, Latino America and all around the world. You have been such wonderful friends and my family in Canada. I don't have enough room to mention all of you but you know who you are. Thanks for being part of my life!

Table of Contents

1. Introduction 1
  1.1 Management Systems and International Standards 1
  1.2 Integration of Management Systems 2
  1.3 Problem Statement 4
  1.4 Structure of the Thesis 4

2. Literature Survey 6
  2.1 Introduction 6
  2.2 The Systems Perspective 6
  2.3 The Stakeholder's Theory 7
  2.4 Management Systems 8
    2.4.1 Appearance and Standardization 8
    2.4.2 Isolation of Standardized Management Systems 10
  2.5 Integration of Management Systems 12
    2.5.1 The Concept of Integration 12
    2.5.2 The Integration Boundaries 15
    2.5.3 Interrelations in a System 17
    2.5.4 The Process of Integration 18
  2.6 Current IMS Models 19
    2.6.1 The "Systems Approach" Model 20
    2.6.2 The "St. Gall" Model 21
    2.6.3 The "TQM" Model 22
    2.6.4 The "Company System" Model 23
    2.6.5 Analysis of IMS Models 25
  2.7 Advantages and Risks of Integration 26
  2.8 Defining the Components for an IMS 28
    2.8.1 Quality Management System 31
      2.8.1.1 Evolution of Quality 31
      2.8.1.2 Quality Standards 31
      2.8.1.3 Future in Quality Management 32
    2.8.2 Environmental Management Systems 33
      2.8.2.1 Evolution of Environmental Management 33
      2.8.2.2 Environmental Standards 34
      2.8.2.3 Future of Environment Management 35
    2.8.3 Occupational Health and Safety Management System 35
      2.8.3.1 Evolution of Occupational Health & Safety Management 35
      2.8.3.2 Health & Safety Standards 37
      2.8.3.3 Future of Health & Safety Management 38
    2.8.4 Corporate Social Responsibility Management System (CSRMS) 38
      2.8.4.1 Evolution of Social Responsibility Management 38
      2.8.4.2 Corporate Social Responsibility Standards 39
      2.8.4.3 Future in Social Responsibility Management 43
    2.8.5 Auditing of Standardized Management Systems 44
      2.8.5.1 Evolution of Auditing 44
      2.8.5.2 Standardizing Auditing 46
      2.8.5.3 Future for Auditing 47

2.9 Motivation 49
2.10 Objectives 51

3 Defining Research Methodology 53
3.1 Introduction 53
3.2 Overall Research Methodology 53
3.3 Defining Research Objectives 54
3.4 Adapting the QFD for Generating Integration Elements 56
3.5 Designing a Conceptual Framework for Integration 56
3.5.1 Designing and IMS Model 56
3.5.2 Verification of IMS Model 58
3.5.3 Designing the IMS Implementation Methodology 59
3.5.4 Designing an Auditing Subsystem for an IMS 60
3.5.4.1 Developing an AMS 61
3.5.4.2 Enhancing an AMS 61
3.6 Validating the IMS Conceptual Framework 63
3.6.1 CC & IMS Scope Definitions 63
3.6.2 Data Collection 64
3.6.3 Data Compilation 64
3.6.4 Gap Analysis 66
3.6.5 Simulating an IMS Implementation 66
3.6.6 Analyzing the IMS Conceptual Framework 66
3.7 Summary 66

4 An IMS Model 67
4.1 Introduction 67
4.2 Defining the IMS Concept 67
4.3 Defining the IMS Scope 70
4.4 Analyzing Selected Stakeholders 71
4.5 Tailoring a Conceptual Tool for Design 73
4.6 Designing the IMS 75
4.6.1 Finding the IMS principles 75
4.6.2 Defining the IMS framework 77
4.6.3 IMS: The "Motor" Model 78
4.7 Verification of the IMS Model 83
4.8 Drafting the IMS Guidelines 84
4.9 Comparing the IMS against a BEM 87
4.10 Summary 90

5 An IMS Implementing Methodology 91
5.1 Introduction 91
5.2 Supporting Concepts 91
5.3 Defining Methodology Elements 92
5.3.1 QFD 92
5.3.2 PDCA Cycle 93
5.3.3 The IMS Principles 95
4.3.4 Improvement Techniques 95
5.4 Defining the structure 96
5.4.1 Phasing 96
5.4.2 Iterative loops 97
5.4.3 Learning curves 98

5.4.4 Negative feedback loop 99
5.4 A Three-Phased IMS Methodology 100
5.4.1 First phase – Planning the IMS 102
5.4.1.1 Obtain Top Management Commitment 104
5.4.1.2 Perform Initial Review 104
5.4.1.3 Outline IMS Implementation 104
5.4.1.4 Enhance Top Management Leadership 105
5.4.2 Second phase – Implementing the IMS 105
5.4.3 Third Phase – Enhancing the IMS 107
5.5 Summary 108

6 Auditing an Standardized IMS 109
6.1 Introduction 109
6.2 Identification of International Auditing Guidelines 109
6.3 Alignment and Harmonization of Auditing Requirements 110
6.4 Creating an Auditing Proto-System (APS) 111
6.4.1 Enhancing Audit Quality 111
6.4.1.1 Auditing principles 114
6.4.1.2 Managing Auditing 114
6.4.1.3 Individual Audit Procedures 115
6.4.1.4 Auditors' competence 115
6.4.2 Consolidation of the Auditing Proto-System 115
6.5 Auditing an Integrated System 117
6.6 Drafting the Guidelines for an Auditing Management System 120
6.7 Summary 123

7. Auditing and Enhanced IMS 124
7.1 Introduction 124
7.2 Auditing Roles 124
7.3 Auditing along IMS Implementation Methodology 125
7.4 Auditing Evolution 129
7.5 Analysing Assessment Techniques 131
7.6 Integrating Self-Assessment and Benchmarking into the AMS 131
7.7 Assessment Roles for Implementing an IMS 136
7.8 Summary 137

8 From QMS to an IMS 139
8.1 Introduction 139
8.2 The Case Company "A" (CCA) 139
8.3 Implementing an IMS in CCA 141
8.4 First Phase – Planning the IMS 141
8.4.1 Obtaining Top Management Support and Commitment 141
8.4.2 Initial Review 143
8.4.3 Outline IMS Implementation 145
8.4.4 Enhance Top Management Leadership Skills 145
8.5 Second Phase - Implementing an IMS 145
8.5.1 Identify Stakeholders 146
8.5.2 Define values and objectives 148
8.5.3 Identify and plan Set of Processes 149
8.5.4 Provide Training and Awareness to Employees 153
8.5.5 Gather Necessary Resources 154

8.5.6 Implement New or Modify Current Processes 155
8.5.7 Operate Processes 157
8.5.8 Auditing the System 158
8.5.9 Measuring stakeholders' Satisfaction 160
8.5.9.1 First Cycle – Enhancing Quality 160
8.5.9.2 Second Cycle – Including Environment 161
8.5.10 Integration of Remaining MSs 163
8.6 Summary 164

9 From EMS to an IMS 166
9.1 Introduction 166
9.2 The Case Company "B" (CCB) 166
9.3 Applying the IMS Implementing Methodology Guidelines 168
9.4 First Phase – Planning the IMS 168
9.4.1 Obtain Top Management Commitment 168
9.4.2 Initial Review 170
9.4.3 Outline IMS Implementation 173
9.4.4 Enhance Top Management Leadership 173
9.5 Second Phase - Implementing an IMS 173
9.5.1 Identify Stakeholders and Maintain Communication 174
9.5.2 Define Values and Objectives 175
9.5.3 Identify and plan set of processes 178
9.5.4 Provide Training and Awareness to Employees 183
9.5.5 Gather Necessary Resources 184
9.5.6 Implement new or modify current processes 185
9.5.7 Operate processes 187
9.5.8 Auditing the system 187
9.5.9 Measuring Stakeholders' Satisfaction 189
9.5.9.1 First Cycle – Enhancing Environment 190
9.5.9.2 Second Cycle – Including Quality 191
9.5.10 Integration of remaining MSs 192
9.6 Summary 193

10 Conclusions 195
10.1 Contributions of the research 195
10.2 Research Limitations 198
10.3 Venues for future research 199

Bibliography 200

Appendix A-1 – Analysis of Stakeholders' Requirements 216
Appendix A-2 – IMS Principles 219
Appendix A-3 – IMS Elements. General Description 221
Appendix A-4 – IMS Documentation and Records Requirements 225
Appendix A-5 – IMS Guidelines 225
Appendix B-1 – Validation of the IMS Model 245
Appendix B-2 – Request for Ethics Board Approval 253
Appendix B-3 – Sample of Survey applied to ISO/CAC/TC 176 258
Appendix C (C-1 to C-18)– IMS Implementation Methodology Procedures 264
Appendix D-1 – Analysis of AA 1000 Section 10 (Auditing) 273
Appendix D-2 – Consolidation of the Auditing Proto-System 275

Appendix D-3 – Auditing Management System (AMS) Requirements 279
Appendix E-1 – CCA IMS – Identification of Stakeholders 282
Appendix E-2 – CCA IMS – Resources 283
Appendix E-3 – CCA IMS – Modification of Processes 288
Appendix E-4 – CCA IMS – Auditing Requirements 293
Appendix F-1 – CCB IMS – Identification of Stakeholders 295
Appendix F-2 – CCB IMS – Resources 297
Appendix F-3 – CCB IMS – Modification of Processes 300
Appendix F-4 – CCB IMS – Auditing Requirements 305

List of Figures

Figure 2-1: The “Systems Model” for IMS 21
Figure 2-2: The “St Gall” Model 22
Figure 2-3: The TQM Model for IMS 23
Figure 3-1: General Research Methodology 55
Figure 3-2: Procedure for Designing an IMS Model 57
Figure 3-3: Aspects for Designing an IMS Methodology 60
Figure 3-4: Methodology for Developing IMS auditing guidelines 62
Figure 3-5: Company Cases Development 65
Figure 4-1: From the Initial Mix to IMS 68
Figure 4-2: A Four-House Quality Sequence towards an IMS 74
Figure 4.3: The second HoQ – Defining the IMS model 79
Figure 4-4: The IMS “Motor” model 80
Figure 4-5: The IMS “Motor” model and its founding MS Standards 81
Figure 4-6: Writing the IMS guidelines 85
Figure 5-1: Third House of Quality – The IMS methodology 94
Figure 5-2: Road towards integration 95
Figure 5-3: Learning curves when implementing an IMS 99
Figure 5-4: A negative feedback loop 100
Figure 5-5: The IMS Implementation Methodology 101
Figure 6-1: Auditing MSs and an IMS 109
Figure 6-2: Deployment of auditing elements into the IMS model 119
Figure 7-1: Compliance verifier – Improvement driver for an IMS 126
Figure 7-2: Training – Knowledge Sharing for an IMS 127
Figure 7-3: Auditing Role Mix during the implementation process 128
Figure 7-4: Evolution of auditing 130
Figure 7-5: Relationship between auditing, self-assessment and benchmarking 133
Figure 8-1: CCA Organizational Chart 141
Figure 6-3: CCA Operative Processes 150
Figure 9-1: CCB Top Management 169
Figure 7-2: CCB Diagram Processes 180

List of Tables

Table 2-1: Current Management System Standards 11
Table 2-2: Analysis of IMS Models 24
Table 2-3: Analysis of Standardized Management System 30
Table 2-4: Summary of OHS Standards 37
Table 2-5: Comparison of General Features of CSR Standards 41
Table 2-6: Comparison of Management Element of CSRMSSs 42
Table 4-1: Interaction of stakeholders in an IMS 73
Table 4-2: Defining the Stakeholder requirements 76
Table 3-4: IMS principles 77
Table 5-1: Set of concepts supporting the IMS methodology 92
Table 5-2: Characteristics defining an IMS Implementation Methodology 103
Table 6-1: Comparing AA100 auditing issues to ISO 19011 110
Table 6-2: Enhancing the quality of auditing 112
Table 6-3: Consolidation of audit principles 116
Table 6-4: Approaches for integrating auditing requirements 118
Table 6-5: Requirements for auditors: the IMS and the APS 121
Table 7-1: Including self-assessment and benchmarking into the AMS 134
Table 7-2: The roles of auditing through the IMS implementation 138
Table 8-1: CCA's Profile 140
Table 8-2:.Leadership Results (Extracted from Appendix Z) 144
Table 8-3: Implementation Planning 145
Table 8-4: Leadership Skills Training Program 146
Table 8-5: Defining Stakeholders – First Implementation Cycle 147
Table 8-6: CCA Values and Objectives 148
Table 8-7: Identification and Planning NPI Process 151
Table 8-8: Training Employees 153
Table 8-9: List of Resources 154
Table 8-10: Modifying Processes 156
Table 8-11: Auditing Resources 159
Table 8-12: Measuring CCA Enhanced QMS Stakeholders' Satisfaction 161
Table 8.13: Measuring CCA IMS Stakeholders' Satisfaction 162
Table 9-1: The CCB Profile 167
Table 9-2: CCB Leadership Initial Review 172
Table 9-3: Implementation Planning 173
Table 9-4: CCB Leadership Skills Training Program 174
Table 9-5: Identification of Stakeholders 176
Table 9-6: CCB Values Definition 176
Table 9-7: CCB Objectives Definition 177
Table 9-8: Defining Process "Building Power Generating Facilities" First cycle 180
Table 9-9: Defining "Building Power Generating Facilities" Second cycle 181
Table 9-10: Training Program 182
Table 9-11: Information Resources 183
Table 9-12: Implementing IMS process requirements 185
Table 9-13: Auditing Resources 188
Table 9-14: Measuring Stakeholders' Satisfaction - First Cycle 190
Table 9-15: Measuring Stakeholders' Satisfaction – Second Cycle 191

Glossary of Abbreviations

AA1000	AccountAbility 1000
AIHA	American Industrial Hygiene Association
AMS	Auditing Management System
APS	Auditing Proto-System
BEM	Business Excellence Model
BEP	Business Enterprise Plan
BSI	British Standard Institute
BU	Business Units
CCA	Case Company "A"
CCB	Case Company "B"
CEA	Canadian Electric Association
CSA	Canadian Standards Association
CSP	Corporate Strategic Plan
CSRMS	Corporate Social Responsibility Management System
E-IMS	Enhanced Integrated Management System
EFQM	European Foundation Quality Management
EMAS	Eco-Management Assurance Scheme
EMS	Environmental Management System
GAAP	General Accepted Accounting Principles
GAAS	General Accepted Auditing Standards
HoQ	House of Quality
ILO	International Labour Organization
IMS	Integrated Management System
ISEA	Institute of Social and Ethical Accountability
ISO	International Organization for Standardization
ISO 9001	Quality management system - Requirements
ISO 14001	Environmental management system - Requirements
ISO/CAC/TC 176	ISO Technical Committee 176 on Quality Management and Quality Assurance (Canadian Chapter)
IC	Integrated Circuit
IP	Intellectual Property
IT	Information Technology
IUMSS	Integrated Use of Management System Standards
MBNQA	Malcolm Baldrige National Quality Award
MS	Management System
MSS	Management System Standard
NPI	New Product Introduction
OHSAS 18001	Occupational Health & Safety Assessment Series
OHSMS	Occupational Health & Safety Management System
PDCA	Plan-Do-Check-Act Cycle, also known as Deming or Shewhart Cycle
QFD	Quality Function Deployment
QMS	Quality Management System
S-IMS	Standardized Management System
SAI	Social Accountability Institute
TQM	Total Quality Management
WHO	World Health Organization

1. Introduction

Organizations are required to meet comprehensive and, sometimes, even contradictory requirements from different stakeholders. For instance, customers are demanding improved quality and more features in products and services. Environmental government agencies and the public in general are more aware of an organization's responsibility towards the environment which is reflected in new and even more stringent regulations. Employees, labour unions and government are demanding better conditions of health and safety in the workplace. These and other requirements from stakeholders are part of the daily problems top management must address if the organization is to survive and thrive.

To deal with these issues, organizations must implement programs, functional areas or management systems to satisfy these sets of requirements and stakeholders. To implement such management initiatives in a recognized and stakeholder-valued approach many organizations have chosen to follow the requirements set in international standards such as those for quality (ISO 9001:2000) and for environment (ISO 14001:2004). In the last decade the number of internationally recognized standards for specific management systems has been steadily increasing.

1.1 Management Systems and International Standards

For instance, the International Organization for Standardization (ISO) has adapted the generic requirements of ISO 9001:2000 to create standards that describe specific requirements for a quality management system in particular applications: ISO 13485:2003 in medical devices, ISO/TS 29001:2003 for oil and gas, ISO TS 16949:2004 for automotive production and so on. In addition, to support ISO 9001:2000, a number of other standards have been released, addressing different elements of the quality system, e.g. ISO 9004:2000 for performance improvement, ISO 10002:2004 for complaints handling and ISO 19011:2002 for quality auditing. A similar development has developed the ISO 14000 series to manage the environmental issues of an organization.

Using standards to describe functional-related MS has gone beyond quality and environmental issues. For instance, employees' safety and welfare, labour rights, business ethics, corporate governance, accountability, dependability, information security, food safety and IT service are among the issues that have been targeted by different organizations besides ISO. Although still in a nascent stage, they are expected to be adopted by many organizations as a consequence of increasing pressures from their stakeholders.

According to the latest numbers released by ISO (ISO 12th Survey Cycle), by the end of 2004 more than 670,000 organizations have been registered as ISO 9001 compliant whereas for ISO 14001, more than 90,000 registrations have been awarded worldwide. Registrations to ISO 14001, although currently with smaller numbers than those of quality, had a significant increase of 37% over the previous year. Organizations all around are looking to be considered environmentally friendly, complying with increasing environmental regulations and treaties such as the Kyoto Protocol.

For some other standards like the ones for occupational health and safety and social responsibility no reliable statistics are available, yet their importance to organizations is manifest. For instance, corporate social responsibility, which includes labour rights, corporate governance and accountability, and business ethics, is making headlines in the news on a daily basis. For instance, in recognition of increasing stakeholder concerns arising from recent high-profile scandals, regulations controlling financial accountability and corporate governance are being launched, e.g. the Sarbanes-Oxley Act in USA. To manage these issues and satisfy involved stakeholders, existing standards are increasingly used by interested organizations with more standards being updated and developed at the national and international levels.

1.2 Integration of Management Systems

Traditionally, an organization would implement its management systems one at a time, with their boundaries remaining clear-cut after the implementation process to highlight their importance to employees. As a result, however, isolation among management systems and with the overall business management is most likely to happen, hindering the chances to achieve some of the expected benefits and creating new problems of its own. Waste of resources, conflicts of interest, sub-optimization of local goals in opposition of overall goals, repetition of activities, increasing paperwork, confusion on priorities and objectives and a general lack in achieving the organization's objectives may be some of the problems created by this lack of connectivity among functional management systems that have been implemented using standards.

This lack of integration between management systems has been recognized by researchers, practitioners and standards developers, mostly from the quality field, resulting in different initiatives to counteract it (Karapetrovic and Willborn, 1998; Wilkinson and Dale, 1999). For instance, MS standards for quality (ISO 9001:2000), environment (ISO 14001:2004) and occupational health and safety (OHSAS 18001:2002) have been made more compatible with each other. Also, standards bodies have released initiatives for integration: AZ/NZS 4581 in Australia, DS/S-387 in Denmark and UNE 66177:2005 in Spain. ISO is also currently engaged in two initiatives for integration: first, drafting guidelines for integration, an Integrated Use of Management System Standards (IUMSS) Handbook, expected to be released in 2006; second, developing new versions of ISO 9001 and ISO 14001 with the same structure and wording for their common elements. In addition, a number of models have been developed by quality researchers to integrate different MSs (Karapetrovic and Willborn, 1998c; Conti, 2001; Wilkinson and Dale, 2001). These efforts are all in response to the increasing needs of the business community regarding the integration of current and future standardized MSs.

Although some work has been done for the integration of management systems, further work is still required, both conceptual and empirical. The most pressing need, identified by Jonker and Karapetrovic (2004), is to develop a model for the integration of management systems along with a supporting methodology for its implementation. Additional considerations to be included in both the model and the methodology are:

- Different starting points to build upon, e.g. an ISO 9001 QMS or an ISO 14001 EMS or none at all.
- Different sequences of integration, e.g. an IMS covering quality and environmental requirements may be implemented by integrating QMS first and EMS later or an EMS first followed by a QMS.
- Different finishing points according to organization's own needs, e.g. an IMS including quality, environmental and occupational health and safety requirements.
- The need for engaging stakeholders into the systems to optimize the organization's performance;
- Level of integration of functional standardized requirements within the IMS, e.g. alignment or harmonization (Karapetrovic and Willborn, 2002).
- Auditing, evaluation, control and improvement of an IMS (Dale, 2004).

These considerations are missing in the existing models developed to integrate management systems, thus creating an excellent opportunity to perform valuable research.

1.3 Problem Statement

In order to support the current and future development of integration of management systems, the purpose of this research is to design a conceptual framework for the integration of standardized Management Systems that includes an IMS model as well as supporting methodologies. This model should be capable of being applied to any organization, adaptable to different starting and finishing points, representing each organization's particular priorities. The model should be sustained by guidelines describing the implementation process and the auditing sub-system.

1.4 Structure of the Thesis

This study presents a comprehensive, flexible and generic IMS conceptual framework that may be used to integrate standardized MSs. To cover related and current information on integration and standardized management systems an extensive literature survey is presented in the Second Chapter, concluding with a description of the motivation for this research and establishing the research objectives.

Chapter Three presents the overall research methodology supporting the development, verification and validation of the conceptual framework for integrating selected standardized management systems. From an initial, high-level description of the research methodology several chapter specific methodologies are described, illustrating how each stage for design, verification and validation was conducted.

Based on findings from Chapter Two and supported by the research methodology described in Chapter Three, Chapter Four describes how an Integrated Management System (IMS) model is constructed to harmonize and integrate requirements for all four standardized Management System (MSs) considered in the scope: QMS, EMS, OHSMS and CSRMS. To assure robustness in the model design and subsequent methodology for implementation, the Quality Function Deployment (QFD) method was employed to support it and the model underwent a verification process from ISO/TC 176, a group of

Canadian Quality experts, by means of a survey. The resulting IMS model, its seven elements and corresponding requirements are presented and discussed.

Guidelines for auditing and implementation of an IMS supporting the IMS model are also developed:

- Chapter Five describes the creation of a supporting methodology for implementing the IMS model based on the original QFD used for model development. A flexible three-phased roadmap, which can be used for different scope and sequence of integration, is presented. Each phase is deployed into stages and particular requirements are described for each of those stages
- Chapter Six discusses the challenges for auditing an IMS. A set of guidelines describing an Auditing Management System (AMS) model is then developed using the IMS model as the underlying structure. Auditing requirements are taken from applicable standardized guidelines for auditing and identified auditing "best practices" to enhance the quality of audits.
- Chapter Seven presents an analysis of auditing as an assessment tool supporting the IMS implementation methodology. Self-assessment and benchmarking requirements are integrated into the AMS, broadening its usefulness beyond compliance verification to actually contribute to the IMS implementation process.

Chapters Eight and Nine are dedicated to validate the flexibility of the entire IMS conceptual framework to address different starting points, sequences of integration, organizational contexts and stakeholders' requirements. Each chapter simulates an IMS implementation process using real-life data from two Canadian companies. Chapter Eight presents an ISO 9001 registered company while Chapter Nine presents an ISO 14001 registered organization. From these initial conditions, gaps against the IMS model are identified and a possible path for implementation is then discussed for each company based on utilization of the two sets of supporting guidelines previously developed. Based on this simulated implementation of two IMS, areas of improvement for the whole conceptual framework are identified and included if deemed necessary.

Finally, Chapter Ten concludes the thesis with a summary of the analysis and contributions of the research, defining areas for future empirical and conceptual research towards integration of management systems.

2 Literature Survey

2.1 Introduction

In this chapter, a literature review is presented on a number of topics influencing development, implementation and integration of standardized management systems. First, two theories are explored to provide conceptual grounds for management and integration: the systems perspective and the stakeholders' theory. Then, the models, standards and literature on integration of standardized management systems are presented and analysed, defining critical issues integration should include. Subsequently, four existing standardized management systems, identified as the most suitable candidates for integration, are presented, describing their general development and relevance to organizations and their stakeholders. To complement this analysis on the assurance systems, the evolution of auditing different management systems is also explored. Each issue illustrated in this chapter also includes future lines of development, looking to emphasize the dynamic nature of the management body of knowledge, a fact that will be addressed when integrating different management systems. This chapter concludes defining the motivation and objectives for this research.

2.2 The Systems Perspective

According to the systems perspective, reality can be conceptualized as a system or part of a system for purposes of understanding (Hitchins, 2003). This is also applicable to organizations. There are different definitions of "system". From a long-sentence concept employed by Hitchins (2003) "*an open set of complementary, interacting parts with properties, capabilities, and behaviours emerging both from the parts and from their interactions*" to a very short definition like "*a community of connected entities*" coined by Sherwood (2002). Nevertheless, the common concept shared by these definitions is the underlying role of the connections and interactions between elements in a system. This elements and the system itself can be defined by determining the system boundaries (Cusins, 1994), which can be changed according to the viewers' needs in understanding specific parts or behaviours of the system. Considering systems and elements as part of a bigger system helps to understand how a system performs better and obtains different attributes than the collection of its elements working alone. Emergence, self-organization and self-correction are attributes that define a system (Sherwood, 2002). In the last half century, it has been encouraged to use the systems perspectives to the analysis of physical or social subjects and events, in search for a better and more comprehensive understanding (Churchman et al., 1957; Forrester, 1961; Bertalanffy, 1969; Beer, 1979; Checkland, 1999; Senge, 1990; Sterman, 2000; Hitchins, 2003).

The systems thinking approach has been also applied to several areas of management. For instance, it has been applied to design systems to manage quality (Cusins 1994; Burgess 1998; Jambekar 2000; Karapetrovic and Willborn 2002; Khanna et al., 2002 and 2003), environment (Stave 2002), social responsibility (Gregory and Midgley 2003) and risk management (White 1995). Furthermore, the latest version of ISO 9001 adopted the systems approach as one of the eight management principles. This fact illustrates its ability to facilitate the visualization and understanding of the relationships between management systems, the organization and its stakeholders.

2.3 The Stakeholder's Theory

From the traditional economic point of view, an organization is a system that is totally focused to achieve one goal, i.e. maximizing its profitability according to contractual duties it has with its owners (Smith, 1937; Brenner and Cochran, 1991). However, this has changed as a consequence of a better understanding of the impact organizations and businesses have over the society in general. Changes in existing legislation targeting corporate governance (Preston and Sapienza, 1990; Polonsky and Ryan, 1996), environmental issues (Davis, 2004; Goosey, 2004), and human and labour rights (Pull, 2002; Liebertwitz, 2004) are solid evidence that an organization has responsibilities not only to its shareholders or owners but also towards other entities not considered in the traditional economic approach of a firm.

The stakeholders' theory, developed by Freeman in 1984, included this variety of responsibilities and involved parties into the firm model. Freeman suggests that an organization has responsibilities towards several entities, called interested parties or stakeholders that by definition are those entities that affect or affected by the organization (Freeman, 1984 p. 46). These responsibilities are not only economic and financial but also social and environmental identifying other stakeholders besides shareholders (Freeman, 1984; Carroll, 1989; Droge et al., 1990; Wood, 1993; Key, 1999; Bakan, 2004).

The concept of stakeholder offers several advantages: clarity of responsibility (Key, 1999), corner stone for a social-responsibility doctrine (Moir, 2001), better economic performance on addressing depressed stock prices (Clarkson, 1998; Frooman, 1997), and sustainability thinking (Zambon and Del Belle, 2005). However, some shortcomings have been also mentioned: lack of explanation on relationship between stakeholders (Donaldson and Preston, 1995; Key, 1999); conceptual reduction to a static state (Key, 1999); mistaken reliance of an organization as controller of its entire domain (DiMaggio and Powell, 1983; Rowley, 1998); and lack of guidelines for managing change (Key. 1999). Foley (2004) suggested narrowing down the concept of stakeholder, to make it more appropriate for operational purposes. For him, a stakeholder would be an interested party that holds "power" upon an organization such as shareholders, customers and suppliers. By limiting the concept of stakeholder, this definition allows organizations to establish its activities and strategies around those entities that have or will have a significant impact on its development. When defining stakeholders and their needs, an organization must bear in mind that such definitions will change over time as a result of what Schumpeter (1936) called "innovation". Schumpeter defined innovation as the introduction of new factors into an existing system creating growth; this new factors are produced and affect stakeholders and therefore, their relationship with the organization.

The concept of stakeholder presented by Foley (2004) offers a sound conceptual framework on how organizations and their management systems affects and are affected by other parties besides shareholders. It is argued here that an organization is a system formed by a group of stakeholders with strong connections between them and with the organization. When developing management systems it should be analyzed and understood those interrelations between stakeholders and the organization and those links between different management systems.

2.4 Management Systems

2.4.1 Appearance and Standardization

The general objective of an organization is to satisfy relevant stakeholders by meeting their needs. In consequence, organizations have developed management systems to make sure those needs are properly deployed into their organizational structure and can be regularly met. ISO has defined a Management System (MS) as "the organization's structure for managing its processes – or activities – that transform inputs of resources into a product or service which meet the organization's objectives, such as satisfying the customer's quality requirements, delivering profits to shareholders, complying to regulations, or meeting environmental objectives" (ISO, 2000). This concept of MS is applied by ISO when standardizing the requirements for a QMS in ISO 9001 and for an EMS in ISO 14001.

A Management System Standard (MSS) is a set of minimum requirements that an organization has to have in place to manage certain function for delivering processes according to specifications (Daniels et al., 2002). Having a standard fulfills two objectives: first, it facilitates organizations to implement a MS to meet specific stakeholders' needs, and secondly, it provides the means to assure stakeholders an organization has the necessary elements implemented to meet their needs. From these objectives a general methodology for assurance is drawn: First, a MS is implemented based on the requirements addressed in the corresponding standard. After implemented, the management system is audited against the standard to draw a judgement on whether or not this system is deemed acceptable or unacceptable, i.e. pass-not pass and acting upon through preventive and corrective actions. An organization audited by certified organizations known as registrars may obtain a registration when it is deemed compliant with a specific standard. This is the case for ISO 9001, ISO 14001 and other standards. Having a registration helps an organization to show their commitment to their stakeholders and their needs.

In 1987, ISO created ISO 9001, a standard describing the minimum requirements for a QMS in order to provide a common language for all organizations in their deals with quality. This standard has been well received by the business community, with more than 600,000 organizations currently registered worldwide (ISO, 2004). From its inception it has updated twice: in 1994 and 2000. Every update is done to overcome identified flaws and adapt it to current and potential needs of the business community. Building upon ISO 9001 success, specially since the 1994 version, a number of standards have been developed describing requirements for systems to meet other stakeholders' needs, e.g. environment, health and safety, and social responsibility.

The benefits that MSSs may bring to an organization include:

- Increasing the operational efficiency; costs savings through reduction of scrapping, reworking and warranty claims, and enhancement of perceived quality (RAB, 2000; Casadesus et al., 2001; van der Wiele et al., 2001)
- a potential increase of market share (Uzumeri, 1997; NQA, 2000),
- improved quality product (Ebrahimpour et al., 1997; Hoyle, 1994; McLachlan, 1996; and Johnson, 1997)
- avoidance of possible legal liability for social/environmental issues (Keith, 2003)
- a sound alternative to reduce the cost of overall internal costs due to health and safety matters (Takala and Obadia, 1997)
- better corporate image in the eyes of client and society (Rohitratana, 2002)
- improve performance towards sustainability, establishing systematic communication with stakeholders (Gobbels and Jonker, 2003)

On the other hand, using standards has undergone some criticism:

- standards had led to inappropriate emphasis on documentation (Seddon, 1997)
- apparent too easy achievement of certification for those who only want the registration (Gore, 1994; Deegan and Rankin, 1996)
- static frameworks unfocused on products (Corrington, 1994; Streubing, 1996)
- compliance seen as the main objective, skewed to consider solely function specific approaches; potential development of the so-called 'standard syndrome', i.e. standard seen as a goal rather than as a mean (Sunderland, 1997; Conti, 2001)

Both positive and negative aspects of using standardized management systems are mainly referred to information gathered from implementing a QMS or an EMS, following ISO 9001 or ISO 14001 respectively, where more information is available in the literature.

2.4.2 Isolation of Standardized Management Systems

In terms of statistics ISO 9001 and ISO 14001 are the most largely employed management system standards worldwide. However, as a consequence of the unparallel success of ISO 9001 as a set of guidelines for implementing a QMS, a burst of similar management systems is happening. These management systems standards are being released not only by ISO, which is the main international body for standardization, but also other institutions such as the International Labour Organization (ILO), Institute Electrotechnical C (IEC), Institute of Social and Ethical Accountability, and others. Table 2-1 presents a list of the current MSSs. This list although not all inclusive shows two important factors for this research: areas being targeted by those standards and the timeframe of release and update.

Areas	Standards	Publishing Time
Quality		
• Generic	ISO 9001:2000	1987, 1994, 2000
• Automotive industry	ISO/TS 16949:2002	2002
• Medical devices	ISO 13845:2003	2003
• Oil and Gas	ISO/TS 29001:2003	2003
• Software	ISO/IEC 90003:2004	2004
Environmental		
• Generic	ISO 14001:2004	1996, 2004
• Forestry	ISO/TR 14061:1998	1998
Occupational Health and Safety	OHSAS 18001:2002	1999, 2002
Social Responsibility	SA 8000	1999, 2001
	AA 1000	1999
Information Security	ISO/IEC 27001:2005	2005
Dependability	IEC 60300	2004
Food Safety	ISO 22000:2005	2005
IT Service	BS 15000-1	2002

Table 2-1: Current Management System Standards

A quick look into table 2-1 will tell us that all MSSs have been released in the last decade but at different intervals; the targeted areas cover a wide spectrum that includes generic issues such as quality, environmental, health and safety, social responsibility, and more sector specific oriented like dependability, information security, food safety and so on.

This increasing appearance of standards is not an isolated phenomenon. International and national standards are released as a response of increasing pressures organizations must face in their contact with different stakeholders. In some cases, compliance with a specific standard is part of contractual obligation (ISO 9001 or ISO 14001), or embraced to gain exemption of governmental watchdogs (ISO 14001 or OHSAS 18001) or assuring stakeholders their interests are considered within organization's processes, i.e. employees health and safety (OHSAS 18001), environmental agencies and community (ISO 14001) and society (SA8000 and AA1000). However, the idea to comply with other standards is not particularly appealing to organizations in general, especially if previous experiences haven't met their expectations. This 'explosion of standards', although bringing useful tools to organizations for managing and controlling specific parcels of their performance, is also underlining current problems and creating some problems of their own.

Management systems, created and maintained following specific standards to comply with external requirements, may present some problems: lack of commitment from top management, isolation from the rest of organization, conflict of interest between functions, waste of resources, and lack of achievement of those stakeholder-related objectives. Having two or more MSs implemented in a single organization could increase the risk an organization has of actually having these problems. Furthermore, certain problems have been identified as the result of isolation between MSs built based on standards. Throughout the literature, a list of problems derived from such isolation has been identified mostly referred to isolation between QMS and EMS (Corcoran, 1996; Karapetrovic and Willborn, 2002; Wilkinson and Dale, 2002):

- Waste of resources
- Conflicts of interest and confusion in priorities and goals
- Repetition of activities and processes
- Increasing paperwork
- Lack of commitment towards the MS from top management
- Ending up with dissatisfied stakeholders nonetheless for lack of performance

An alternative to overcome isolation among standardized management systems and its corresponding problematic is the integration of standardized management systems.

2.5 Integration of Management Systems

2.5.1 The Concept of Integration

Integration, however, is not an easy word to define; throughout the literature available on integration of management systems each writer has a specific idea on its meaning.

- *Loss of independence*: Karapetrovic and Willborn (1998c) presented the Integration of Managements Systems as the consecution of a 'System of systems' inside the organization. This Super System "embraces different function-specific management systems in only one in a way that all of them are dependent of the rest of them". Therefore, "Integration" is seen as the loss of independence of the components.

- *Similar approach that alignment*: MacGregor Associates (1996) presented these two concepts in a clear manner by saying that Integration happens when in the organization exists "a single top level management 'core' standard with optional modular supporting standards covering specific requirements. On the other hand, Alignment happens when in the organization exists "parallel management system standards specific to an individual discipline, but with a high degree of commonality of structure and content".
- *Standardization*. Dessler (1992) mentioned that standardization, i.e. coordination by rules or procedures, could be used as a basic stepping-stone for coordination/integration.
- Wilkinson and Dale (2002) established that integration has been seen under two approaches. An alignment and merging of the documentation, through the compatibility of the standards as the first step and an implementation of the integrated system through a Total Quality Management (TQM) approach'.

When analysed, all but the first definitions of integration are clearly more focused towards how to achieve it rather than to define it. For the purposes of this research integration is defined based on the systems approach. As mentioned before, a system is a group of elements that are interrelated, thus achieving special characteristics that are absent or dormant when elements are isolated, towards an all encompassing objective or set of objectives. The key word here is "interrelated", which is a property of true systems that, for all purposes, can be considered interchangeable to "integrated". When a group of activities, processes or systems are working impacting each other and using elements from one another, these interrelations are, in fact, an expression of such integration. Therefore, the resulting system from integration of standardized management systems also known as Integrated Management System (IMS) is defined here as "a group of management elements that are interrelated working towards a balanced set of goals, which includes stakeholders' and organization's requirements".

In defining the boundaries of a system, the elements that are contained within the system are also established as well as the interrelations existing between them. However, the boundaries of an IMS are not that clear and every writer seems to have different notions of what they should be. Throughout the current literature, integration is almost always considered as a particular process that will obtain a comprehensive, multi-stakeholder and larger IMS that will attend and satisfy all related stakeholders, hopefully, with a better performance than the total obtained by those isolated management systems working all by themselves. Nevertheless, this common consideration ends up with a disagreement of what the scope of such multi-stakeholder and larger resulting system would be. This issue of the scope will be discussed further in another section but it is a good example of the many issues that integration of management systems should consider.

A significant part of the literature is devoted to identifying particular aspects about integration of management systems (Wilkinson and Dale, 1998, 1999 and 2002; Karapetrovic and Willborn, 1998, 1998b, 1998c; Karapetrovic, 2003; Rocha and Karapetrovic, 2003 and 2003b; Beckmerhagen et al., 2004; Jorgensen et al., 2005). These issues discuss specific parts of the integration process, not only the integrative model, but also required tools, methodologies and resources. To offer a systematic view of such issues, a simple definition of system will be used. Since a system is a 'group of elements within certain boundaries that are interrelated towards a set of common objectives' integration issues are clustered in boundaries and interrelation, each of them addressing specific questions.

1. Boundaries
    a. What management systems should be considered?
    b. Should it be a final system or allow new management systems?
    c. Should Integration of standards or only integration of internal MSs be addressed?
    d. Should the system be at the same level of minimum requirements that of its original management systems?
    e. What aspects from the overall business management systems should be also included to increase the odds of success?
2. Interrelations
    a. What should be the level of integration between the systems?
    b. What management elements should be included and to what extent?

    c. What would be the criteria to address difference in terms of context and content between management systems?
    d. What should be the impact on organization's hierarchical levels?
    e. Should the standards be integrated into only one? Which ones?

An IMS model, representing this comprehensive system, should take these considerations into account. Furthermore, as suggested by Jonker and Karapetrovic (2004) the model is not enough and a methodology for implementation is also required. Some aspects are strongly related to such methodology as follows:

3. Process of integration
    a. What should be the sequence of integration?
    b. How to address different starting and finishing points? Each organization is unique
    c. How to smooth the process and engage employees and stakeholders?

In the following section each category will be explored to understand what is needed for integration and how this would be done.

2.5.2 The Integration Boundaries

Defining the boundaries of an IMS will define the scope and, in the end, the IMS itself. In this case, the boundaries are defined by the number of management systems to be integrated. Several questions are underlying this decision (Conti, 2001; Wilkinson and Dale, 1999 and 2002; Scipioni et al., 2001; Brandao et al., 2001; Beckmerhagen et al., 2003; Jonker and Karapetrovic, 2004). For instance, the type of management systems to be considered is usually narrowed down to those having internationally standardized versions such as QMS and EMS. Since international standards are released and used as a result of the needs of society and organization, globally speaking, considering those management systems for an IMS increases its appeal and relevance to possible organizations. Having standardized MSs also mitigates the possibility of confusion and misunderstanding between organizations and among employees and management. Although highly relevant for an organization, systems such as financial, accounting and human resources are left out of the scope for this lack of standards, even when their principles, e.g. the General Accepted Accounting Principles (GAAP) for accounting and finance, may be available and recognized internationally.

Throughout the literature some management systems are mentioned more frequently as candidates for integration and included into current IMS models than others. For instance, a combination of QMS, EMS and OHSMS is by far the most common choice (Wilkinson and Dale, 1999 and 2002; Douglas and Glen, 2000; Karapetrovic and Willborn, 1998 and 2001; Beckmerhagen et al., 2003; Brandao et al., 2001: Jonker and Karapetrovic, 2004; Scipioni et al., 2001; Chan et al., 2002; Scipioni et al., 2001; Shen and Walker, 2001; Zutchi and Sohal, 2005). A fourth MS that has been increasingly mentioned is Corporate Social Responsibility (CSR) (Beckmerhagen et al., 2003; Rocha and Karapetrovic, 2003b; Castka et al., 2004) and sustainable development (Rocha et al., 2005). In some cases, industry-specific standards have also been considered within the IMS: transportation security (Chan et al., 2001); safety contractor certification (Heinloth, 1999) and forest certification (Johnson and Walck, 2001). The number and type of management systems would influence most of the remaining issues for integration, which makes this decision a critical one.

In addition to deciding what management systems to be included when integrating, considerations should be added to make the IMS a dynamic system, i.e. flexible enough to include new systems besides the originally selected. This flexibility is one of the most appealing yet one of the most challenging to obtain characteristics of an IMS (Beckmerhagen et al., 2003; Jonker and Karapetrovic, 2004; and Jorgensen et al., 2005). To achieve this flexibility a number of alternatives have been mentioned: a generic framework (Wilkinson and Dale, 2002; Jonker and Karapetrovic, 2004; and Jorgensen et al., 2005); incorporate standardized management systems that follow ISO Guide 72 for compatibility (Karapetrovic, 2003; Zutchi and Sohal, 2005) and models with functional modules (Beckmerhagen et al., 2003; and Jorgensen et al., 2005). Further analysis on these alternatives is presented in the following section. Eventually, any proposed model for integration of management systems should consider flexibility as an objective of utmost importance.

Integration of management systems has caught also the attention of standard developers. Although designing a standard for an IMS was considered a viable option (Beechner, 1997; Wilkinson and Dale, 1999), nowadays this option is seen as a rigid and non added-value considering the changing nature of organization's requirements (Karapetrovic, 2003; Jonker and Karapetrovic, 2004; Jorgensen et al., 2005). ISO, choosing a different path, is currently engaged in two initiatives for compatibility and integration of ISO 9001 and ISO 14001. However, both initiatives are facing current difficulties. For instance, the first option is a handbook named "Integrated Use of Management Systems Standards" (IUMSS), illustrating how ISO 9001 and ISO 14001 can be integrated into organizations. Although expected to be released in 2006, ISO is having significant problems developing it as no research on this topic has been done to support it. On the other hand, the second initiative aims for higher compatibility between ISO 9001 and ISO 14001. A joint task group, formed by TC 176 and TC 207, has been appointed by ISO to develop new versions of these standards with the same structure and identical wording for common elements. These versions are expected to be released by 2012. Creating these new versions between ISO 9001 and ISO 14001 will indeed help to increase their compatibility; however, integration between different elements are still left unanswered and, by including only QMS and EMS leaves the scope severely narrowed. Therefore, a need for further research on integration with a broader scope is necessary.

Until now the scope of the resulting IMS is being considered only to the extent of their originating management systems, i.e. standardized process elements. However, some writers have suggested that some elements, not considered within these standards, are necessary for a successful integration. For instance, Wilkinson and Dale (2002) mentioned organizational culture as an extra ingredient for an IMS. Jorgensen et al (2005) proposed to include learning organization principles and interaction with stakeholders. Moving beyond the common standard elements may help to a smooth and successful integration. Defining issues related to the boundaries and elements of an IMS is a first step. However, integration happens to a more in-depth level, i.e. interrelations among those elements.

2.5.3 Interrelations in a System

In a system, the interrelations between elements provoke the appearance of intrinsic and desired features such as stability, self-control and synergy.

Several aspects need to be addressed to obtain strong links between the IMS elements. For instance, the level of integration between management systems has been analyzed in several papers, where three main levels are suggested: alignment, harmonization and amalgamation. The first level requires having similar elements of management system aligned. Although easy to do since standards share common elements (see ISO Guide 72), this approach only brings marginal gains and no true integration (Karapetrovic, 2003). The second level requires more analysis to address the difference between similar elements to 'harmonize' the requirements paving the road towards a fully amalgamation (Karapetrovic and Willborn, 2000; Wilkinson and Dale, 2002). Finally, the third level is where true integration is found, resulting in a single system able to cope with all stakeholders requirements. However, this level is hard to acquire and probably for some organizations is not desirable (Jonker and Karapetrovic, 2004; Jorgensen et al., 2005).

Furthermore, integration would impact differently along the organizational hierarchy. According to Karapetrovic (2002), top and low levels are where integration should be completed the fullest, leaving middle management free to choose whether functional or integrated driving, according to the own organizational needs. Factors to be considered in this decision are: size of the organization, business strategy, risk and priority for each MS. Defining the boundaries and interrelations for a larger, multi-stakeholder system is an important step towards integration of management systems. However, guidelines and tools for actually doing it are required.

2.5.4 The Process of Integration

Having a framework representing the elements of an IMS along with its interactions is a step forward integration. However, what organizations and top management also need is some guidelines or a "roadmap" on how to go from point "A", its current situation, to point "B", having an IMS implemented (Karapetrovic, 2003; Rocha and Karapetrovic, 2003; Jorgensen et al., 2005). Also, the special features of an IMS such as its broad scope, the number of targeted stakeholders and the possible resistance from employees to any change may require of new tools and methodologies to perform specific IMS activities or implement some parts of the system. This set of tools and methodologies, plus the implementation roadmap, should be flexible, generic and assertive as possible to facilitate the integration of management systems in an organization.

Flexibility during the integration process is a must. A number of key issues should be considered to provide with enough flexibility to the integration process so organizations would find it useful and attractive (Jonker and Karapetrovic, 2004). Among these issues are: the different starting points towards an IMS since each organization is unique, the possibility of different finishing points according to organization's particular needs, finding the proper sequence of integration, the need of organizational cultural change (Wilkinson and Dale, 2002, Jorgensen et al., 2005) to smooth the process and institutionalize it. Although important, providing a methodology and guidelines for integration has been neglected throughout the literature even in those cases where empirical evidence of an IMS is presented. However, the current initiative about integration from ISO recognizes its importance. ISO is developing a handbook for Integrated Use of Management System Standards where guidelines for integration will be presented to facilitate organizations to implement and integrate specific ISO standards.

Some models have been developed to explore the integration of management systems.

2.6 Current IMS Models.

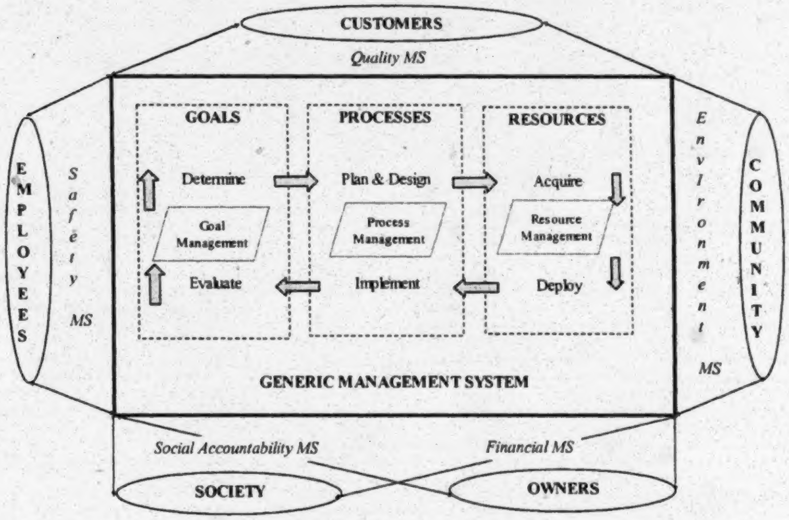
A number of IMS models have been developed, using different combinations of management systems and different approaches toward integration. These models can be differentiated into two groups: company-specific and generic. In the former group, the models are built using specific approaches towards management, usually a company interpretation of TQM, whereas in the latter, standardized and generic MSs are the constituents so the resulting models can be used by any organization. Examples of company-specific management models are found in Vendrig (1996) for American Express, Robinson (1997) for Xerox, in Brandao et al. (2001) for Samarco and in Chan et al. (2002) for MTR Corporation. Due to its highly specific nature, lack of details on its elements and the fact that the starting point is not a particular standardized MS these models are considered no further. However, it is another case in point of the interest of organizations towards integration. On the other hand, generic frameworks have been developed using standardized MSs as the main constituents with an occasional addition of broader concepts such as TQM. In this section, four of these IMS models are described and compared against specific criteria to see how each of them addresses some relevant issues for integration. The results are summarized in table 2-2.

Aspects considered for this analysis are:

- Scope – What Management Systems are considered to be constituents of the IMS?
- Structure – What is the underlying structure or model used to hold the particular systems together?
- Assessment – How the resulting IMS can be assessed to determine whether or not has been properly implemented?
- Process or results oriented – What is the driver for the model, process or results?
- Linkage to organization – How is the resulting system attached to the overall business management?
- Stakeholders – Which stakeholders are considered in the system? How?
- Implementation – System viability for implementation purposes.
- Integration – Is really an integrated system the result of applying the model in an organization?

2.6.1 The "Systems Approach" Model

Created by Karapetrovic and Willborn (1998), this model has been upgraded in the following publications (Karapetrovic, 2002; Jonker and Karapetrovic, 2004) to include more management systems as potential constituents of an IMS. At the beginning, the system model considered only two systems: a quality and an environmental MSs. However, more systems, namely health and safety, are being considered to be suited options for integration as they gain priority in current organizational agendas. Using the systems thinking as the steering philosophy, the model contains three main elements: processes, objectives and resources. A cycle is created between these three elements, which are divided in two levels: the design part and the implementation part. Figure 2-1 illustrates this model.



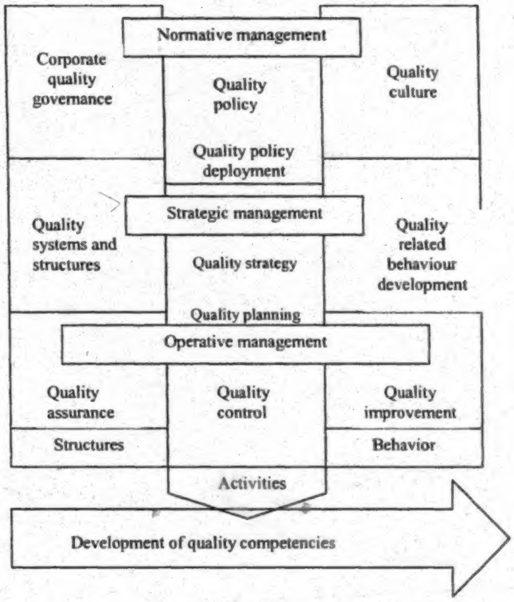
CUSTOMERS
Quality MS
GOALS
PROCESSES
RESOURCES
Determine
Plan & Design
Acquire
Goal Management
Process Management
Resource Management
Evaluate
Implement
Deploy
GENERIC MANAGEMENT SYSTEM
EMPLOYEES
Safety MS
Environment MS
COMMUNITY
Social Accountability MS
Financial MS
SOCIETY
OWNERS

Source: Jonker and Karapetrovic (2004)

Figure 2-1: The "Systems model" for IMS

2.6.2 The "St. Gall" Model

This model was developed by Ulrich and Krieg in 1974 at St. Gallen University. The model, initially set to be a management model, has been adapted by Seghezzi and Schweickardt (2001) for integration purposes and renamed as the St. Gallen Integrated Management Concept. According to the most recent version of the model (Seghezzi and Schweickardt, 2001) it is a generic framework using quality as the main underpinning philosophy for every module. It is claimed that concepts such as ISO 9000, TQM, and lean management can be integrated into this framework allowing organizations to choose what they want to integrate. As illustrated in Figure 2-2, the model starts with management philosophy and it is deployed in a matrix of elements formed by three dimensions and three levels of management. The dimensions are structures, activities and behaviour and the levels are normative management, strategic management and operative management.

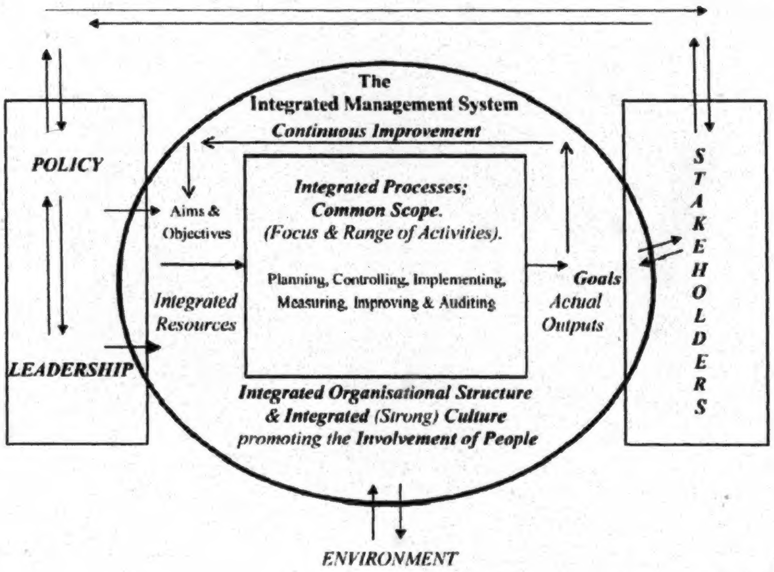

Normative management
Corporate quality governance
Quality policy
Quality culture
Quality policy deployment
Strategic management
Quality systems and structures
Quality strategy
Quality related behaviour development
Quality planning
Operative management
Quality assurance
Quality control
Quality improvement
Structures
Behavior
Activities
Development of quality competencies

Source: Seghezzi and Shweickardt (2001)

Figure 2-2: The "St Gall" Model

2.6.3. The "TQM" Model

Created by Wilkinson and Dale (2001), this model employs the TQM philosophy as the underlying concept for integration. This model was designed to integrate at least three management systems, namely a quality, an environmental and a health and safety MSs. This framework is claimed to emphasize the existence of a strong organizational culture as a main factor for integration, expecting to influence and involve people in the integration processes. The cycle then starts from leadership setting the policy, which is deployed in a number of integrated processes and proving outputs to related stakeholders. The cycle is closed through a feedback loop to leadership. Figure 2-3 presents this model.


The
Integrated Management System
Continuous Improvement
POLICY
Aims & Objectives
Integrated Processes;
Common Scope.
(Focus & Range of Activities).
Planning, Controlling, Implementing, Measuring, Improving & Auditing
Integrated Resources
Goals
Actual Outputs
LEADERSHIP
Integrated Organisational Structure
& Integrated (Strong) Culture
promoting the Involvement of People
STAKEHOLDERS
ENVIRONMENT

Source: Wilkinson and Dale (2002)

Figure 2-3: The TQM Model for IMS

2.6.4 The "Company System" Model

This model, developed by Conti (2001), illustrates how a company can be represented through a set of interactions between its sub-systems, the products generated from each subsystem and the stakeholders that are satisfied from such products. Integration is here seen under TQM principles, where quality extends beyond customer requirements and incorporates other stakeholders. The model identifies six subsystems: managerial, financial, human/social relations, external partners' management, external relations/environment, and product generation. The targeted stakeholders are: the company represented by its management, customers, society, business partners, employees and shareholders. Conti argues that the same process used to provide assurance to customers, e.g. implementing a QMS based on ISO 9001 can be extended to cover more subsystems-product-stakeholders relationships until all the circle is working as a unit.

Element	System Approach	St. Gall	TQM	Company System
Scope	It can be used to integrate a broad range of MSs. QMS, EMS, CSRMS, CHMS, OHSMS are possible integrants	According to authors, this model is able to integrate any quality concept. As example, they mentioned lean management, TQM, ISO 9001.	Three MSs were considered to be part of the IMS: Quality, Environment and Occupational Health and Safety	Overview of entire organization, through six sub-systems where only QMS is explicitly recognized. Interpretation is required
Structure	Systems thinking around: • Objectives • Processes • Resources	Around three management levels: • Normative • Strategic • Operative	Similar to the systems model. Culture and people involvement are element added to improve the model	Structure based on interaction between subsystems, products and stakeholders. Further detail is not provided
Assessment	No guidelines or method for assessment were provided	The model seems auditable, but more information on requirements and levels of performance is required.	The model is expected to be auditable, but no guidelines were provided (Wilkinson and Dale, 2001)	No information is provided to assess sub-systems. QMS can be assessed by ISO 19011
Process/Results oriented	This model is strongly process-based. Results as part of the model needs to be more explicit	As per the model, the resulting system would be processes-based from top to bottom	Process and PDCA approaches are the foundation for the model.	Results oriented: products as link between stakeholders and subsystems
Links to overall MS	No clear explanations or links to the overall business management were provided	The model is expected to be linked to overall business management. However, no feedback and performance measurement were provided.	No explicit connection to the overall business management is provided.	Claims to cover all stakeholders and the whole organization. No mention is done about integration between the six subsystems
Stakeholders	From the scope of the model, several stakeholders can be identified with customers and environment as main targets	From the strong quality side of the model, main stakeholders are customers.	Customers, employees' health & safety and environment are main stakeholders	A broad range of stakeholders is explicitly done.
Implementation	The authors have championed the idea to provide a methodology for implementing any IMS. However, no guidelines have been published.	No guidelines for implementation have been provided	Expected to be straightforward by using MSSs. However, no guidelines were provided	Further detail is required for a practical implementation.
Integration	Since the model is generic, the resulting system is expected to be truly integrated. Further detail is required	The model seems to be able to integrate any possible quality system.	Generic applicability fosters integration purposes. Further detail is required in integration of processes	The notion of integration is still missing when identifying interactions between subsystems

Table 2-2: Analysis of IMS models.

2.6.5 Analysis of IMS Models

An analysis of the four IMS models draws the following conclusions (See Table 2-2):

- The "System Approach" model presents a detailed relation between the model and ISO 9001/ISO 14001 requirements. However, no considerations are included on how the model would deal with the differences in extent and content of some of the standards' requirements, i.e. training. Furthermore, the interactions between management elements and stakeholders are not clear. These are important to assure their engagement into organization's performance to obtain the level of synergy, improvement and savings expected from an IMS.

- The "St. Gall" model is strongly focused in quality and customers as its main stakeholder. No evidence is found that other MSs such as environmental or occupational health & safety are included. Also, it is not clear how particular requirements of quality standards, for instance ISO 9001: 2000, would be deployed to populate the three-level structure. Levels of integration and criteria for addressing dissimilarities between requirements are also missing.

- The "TQM" model introduces organizational culture and communication as key issues for integration. However, no information is provided for the integration of specific requirements into the model as well as the criteria to follow for implementing each MS and to reconcile the dissimilarity in requirements between management systems. Furthermore, some management elements are not explicitly mentioned, i.e. performance measurement and satisfaction of stakeholders.

- The "Company" model addresses a broad range of stakeholders. However, this same broad scope hinders its usability to address very specific issues such as quality and occupational health & safety. For instance, all these systems are included into the production system, which is ambiguous and open to discussion. Moreover, this model lacks of specific criteria for treatment of dissimilarities among each system seems to be still isolated no evidence on how specific systems can be integrated and the levels of integration to be achieved.

In summary, all four IMS models suggest the use of a generic framework to deploy the different elements of a particular management system. However, it remains unanswered a number of questions such as methods of deployment, the levels of integration, the treatment of requirements dissimilarities and flexibility for new management systems. Furthermore, none of these models is accompanied by a methodology or some guidelines to facilitate its implementation. Being constructed over assurance standards, these models should also include some guidelines for auditing to provide assurance to their respective set of stakeholders. No mention of the possible problems and changes required to audit such a broad scope is made. It can be concluded that, although good initiatives in the proper direction, these conceptual constructs need further work to be of practical purposes.

2.7 Advantages and Risks of Integration

A number of advantages have been visualized coming from the process of integration of Standardized Management Systems and the operation of such resulting system:

- Mitigate waste of resources, duplication of documentation and confusion of priorities due to having two or more isolated management systems within an organization while still satisfying the stakeholders' needs (Karapetrovic and Willborn, 1998c; Wilkinson and Dale, 1999)
- Possible reduction in audit fees as well as administrative costs of implementation and maintenance compared with isolated systems
- Potential to be modified to address new requirements within the same system
- Strengthen engagement of stakeholders into the system as providers and clients of an organization.
- A way to achieve "world class" status or to build into the success of organizations' current systems (Wilkinson and Dale, 1998)
- Improvement of understanding and use of the system by everyone within the organization (Tranmer, 1996)
- Provides direction and structures for the business to achieve standards in optimum costs (Wright, 1997).
- Provides a strong foundation towards a learning organization through the implementation of two or more management systems and their integration, regardless of the final level or extent of the resulting integrated system.

On the other hand, researchers have been cautious of integration. Some warnings for specific issues have been highlighted, describing possible areas of risk.

- Reduced flexibility in the resulting system (Crowe 1992)
- Requires, more than ever, a strong support and commitment from top management to be successful
- Must be aligned to the overall business strategy measuring and controlling high level indicators
- May not be suitable to be implemented in all organizations due to the resources and changes required (Karapetrovic, 2003)
- The resulting IMS or the constituting function specific systems would not reflect the organization's actual processes.
- Lack of available methodology or guidelines for implementation and supporting tools (Jonker & Klaver, 1998).
- The resulting IMS covers only the minimum requirements stated in the original standards, thus having the same weaknesses (See section 2.4)

These advantages and risks are to be considered when designing, implementing and controlling an IMS. Further information can be found in Wilkinson and Dale (1999 and 2002); Karapetrovic and Willborn (1998 and 2002) and Beckmerhagen et al. (2004). In general, it can be concluded that the potential advantages of the integration of standardized management systems outweigh its potential risks. However, an organization should decide what is best for them before embarking in such an endeavour. The IMS Scope, level of integration, use of resources and timeframe for implementation are aspects an organization should decide based on its particular conditions of size, type, market, technology required and management experience.

The scope of the IMS, namely which management systems to include, is a key factor in this research. Defining this scope will influence the structure of the IMS, its elements, interactions among requirements and all supporting guidelines and tools. For this reason, in the next section will be analysed different management systems to decide which will be part of this research.

2.8 Defining the Components for an IMS

In Section 2.5.2 it was established that only standardized management systems will be considered as potential candidates for integration. Reasons for this decision were: standards tackle relevant issues for organizations worldwide; internationally agreed requirements, known by involved stakeholders; an already existing infrastructure for managing such systems in terms of institutions, auditors, literature and IT; and last but not least, there is a high probability organizations have one of them already implemented.

In addition, the number of MSSs to be included is a major factor. If this number is small, the resulting system will be relatively easy to implement and control but the impact on performance and the probability to be of interest to organizations may be also small. On the other hand, if the total of MSSs is too high the total value-added for an organization will be also high but unreal, with an extremely low feasibility and hard to implement and manage. For this particular research the grand total of management systems was set at four. This number would provide a highly-valued model yet feasible, controllable, flexible to be adapted to organizations own circumstances.

A set of criteria is developed to select the four standardized management systems to be integrated:

- Considering high-priority stakeholders
- International standards already written; supportive guidelines would be an asset
- Similar underlying model structures
- Registration available
- Relevance to organizations, i.e. Number of organizations already registered
- Existing infrastructure
    - Overseeing bodies
    - Level of literature both theoretical and practical
    - Outside training and consulting institutions

Management systems considered for this analysis were (in alphabetical order): corporate social responsibility, dependability, environmental, information security, IT service, occupational health & safety, and quality. Non-standardized management systems such as those for finance and accounting are excluded from this selection. Although targeting critical issues for an organization, defining such management systems for integration purposes incurs in a problem that is beyond the scope of this research, namely, lack of an internationally recognized and applied standard for management. The GAAP (General Accepted Accounting Principles), sometimes considered as standard for a FMS is in fact a set of principles, similar to those for environment or sustainability, with no guidelines for application and control.

As a result of the analysis, shown in Table 2-3, four management systems are selected to be part of the integration: Corporate Social Responsibility, Environmental, Occupational Health & Safety, and Quality. This combination of MSs would provide a robust IMS that aims to satisfy customers, employees, suppliers, environment, government and society at large, in issues as relevant as the quality of processes and satisfaction of customers, impact on environment, health and safety at workplace, corporate ethics, labour issues and social responsibility. Such objectives are indeed relevant for most organizations, which makes the IMS a relevant and attractive system. On the other hand, Information Security, Dependability and IT service were left out for two reasons: first, their scope is highly specialized scope, mostly technical, which makes them suitable to few organizations, and secondly, their literature currently available is relatively thin, limiting the resources an organization can consult when implementing them.

The four selected management systems will be explored further in the following sections to understand their particular evolution and how they fit for integration.

Aspects	Corporate Social Responsibility	Dependability	Environmental	Information security	IT Service	Occupational Health & Safety	Quality
Primary Stakeholder	Society – Social and Ethical issues	Customer	Environment-Minimize negative impact	Users of information	IT Users	Employees- Health & Safety at workplace	Customer- Quality of process
Secondary Stakeholders	Environment, employees, government	Employees-Internal Customers Suppliers-Partnership	Government-Society-Minimize negative impact in community	Providers of information	Employees – Internal customers Suppliers-Partnership	Labour Union, Government-Enforce OH & S regulations	Employees-Internal Customers Suppliers-Partnership
Primary International Standard	AA 1000:1999; SA 8000; (ISO 26000 in production)	ISO/IEC 60300	ISO 14001:2004	ISO/IEC 27001:2005	BS 15000-1:2002 ISO 20000 (to be released Dec, 2005)	OHSAS 18001	ISO 9001:2000
Related/Derived standards	AA 1000 framework, GRI reporting guidelines	ISO/IEC 60300.3 Series (10 documents)	ISO 14000 Series (21 documents); Eco-Management Scheme Assurance (EMAS)	BS 7799	BS 15000-2:2003	OHSAS 18002 ILO OSH 2001 (From ILO) AIHA 1996 (USA)	ISO/TS 16949 (Automobile); ISO 13845:2003 (medical devices) and others
Date of appearance	1999	2004	1996	2000	2002	1999	1987
Dates for revision	Not applicable	Not applicable	2004	2005	Not applicable	2004	1994 and 2000
Availability of guidelines	AA 1000 framework	ISO/IEC 60300.2 ISO/IEC 60300.3	ISO 14000 Series (21 documents)	ISO/IEC 17799:2005 (Code of practice)	BS 15000-2:2003	OHSAS 18002	ISO 9000 series (30 documents)
Structure	Particular structure	Process approach	PDCA Cycle	PDCA Cycle	PDCA Cycle	PDCA Cycle	Process approach
Certified?	Yes	No	Yes	Yes	No	Yes	Yes
Overseeing bodies	SAI and ISEA	ISO and IEC	ISO	ISO and IEC	BSI (next ISO)	BSI	ISO
Level of current literature	Medium and increasing	Small, technical mostly	High and increasing	Small, technical mostly	Small, technical mostly	Medium and increasing	High and increasing
No. registered organizations	AA1000=216 org SA8000=710 org	Not Available	> than 90,000 org. (ISO Survey 2004)	Not available	Not available	Not available	> than 670,000 org (ISO Survey 2004)

Table 2-3: Analysis of Standardized Management Systems

2.8.1 Quality Management System

2.8.1.1 Evolution of Quality.

The concept of integration of management systems was born and is growing as an initiative from quality researchers and practitioners.

Quality in a product or service was first seen as a binary value, either good or bad, and inspection was the method to judge it (Dale, 2004). Later, quality evolved to a more complex definitions such as "value" (Feigenbaum 1951; Reeeves and Bednar, 1994; Abbott 1955); "conformance to specifications or requirements" (Levitt 1972; Gilmore 1974); and 'fitness for use" (Juran and Gryna, 1974). This increasing complexity of the concept required new approaches in the methodological side: going from inclusion of statistics for sampling to include areas beyond the walls of the workshop and the appearance of national and international standards defining quality management systems (Mangelsdorf, 1999). This standardization has also applied to the quality concept itself. According to ISO 9000 (2005) quality is the "degree to which a set of inherent characteristics fulfills requirements".

2.8.1.2 Quality Standards

In 1987, the first international standard draft of a quality management system was launched: ISO 9001. Later upgraded in 1994 and 2000, ISO 9001 was a hit in the quality field with more than 670,000 organizations registered worldwide (ISO Survey, 2004). The structure of ISO 9001 changed in both updates, going from a set of 20 requirements to a more structured scheme based on the process and systems' approach. Nevertheless, ISO 9001 is still seen as a very generic set of requirements, which makes it a bit confusing and amorphous when implementing it and controlling it. To fix up this weakness, a number of industry-specific and element-specific standards and guidelines have been developed.

The general structure and requirements of ISO 9001 has been adapted to industries where the companies feel more specific requirements are required. For instance, ISO/TS 16949:2004 for automobile, ISO 13485:2003 for medical devices and ISO/TS 29001:2003 for oil and gas industries are some examples of such industry-specific requirements for a QMS. So far, eight standards have been released by ISO, tailoring ISO 9001 to specific applications, including education and government (ISO website, 2005).

On the other hand, ISO 9001 may also be enhanced by supporting guidelines for some of its specific elements. Some of these supporting guidelines are applicable to the whole QMS. For example, describing standardized fundamental concepts and vocabulary is ISO 9000:2005 and ISO 9004:2000 offers guidelines for performance improvement of the whole system, beyond ISO 9001:2000 requirements. On the other hand, some set of guidelines aim for a specific area of a QMS. For example:

ISO 10005 depicts the creation of quality plan; ISO 10017 describes statistical techniques and ISO 19011 contains guidelines for quality and/or environmental systems auditing. A total of 13 documents have been released to support very specific areas of a QMS.

Indeed, the landscape of quality standards and guidelines is becoming confusing. Some effort has been done to put some order and logic behind this development of standards. For instance, ISO 9001:2000 is developed over eight management principles. Two of them in particular provide the necessary conceptual foundation to this understanding: the "process approach" and the "systems' approach". All related standards mentioned before have been updated, incorporating such principles and structure to make it more systematic for organizations and standard developers alike.

As of today, ISO and other standard developers such as BSI, ILO and SAI are trying to make their standards more compatible, either with ISO 9001:2000 (process approach) or with ISO 14001:2004 (Plan-Do-Check-Act approach). Usually some tables are included at the end of the standards, describing how the requirements are compatible with any of these standards. Degree of compatibility among standards will be explored for each of the selected MSs in the following sections.

2.8.1.3 Future in Quality Management

Several lines of evolution in the quality field can be foreseen. One of them is the concept of excellence, which changes the main goal from satisfying customers to delighting them. To describe excellence in operational terms a number of national and regional awards – MBNQA, EFQM, Deming Prize, CBA- have been offered as models. Excellence targets quality but also considers financial, social, ethical and environmental issues (Edgeman, 2000; Garvare and Isaksson, 2001, Boys et al., 2004). Productivity is another line of development where companies are trying to use as optimum as possible its resources, usually through the use of statistical techniques and team management methodologies. Six sigma and lean manufacturing are among this line of quality development. Although initially aimed to manufacturing processes both methodologies are being adapted to bring their benefits to service processes and organizations (Senapati, 2004; Hines et al., 2004). A third line of development is a holistic approach of quality towards more stakeholders. Integration is one of the methodologies being pursued towards that end.

2.8.2 Environmental Management System

2.8.2.1 Evolution of Environmental Management

The management of environmental impacts is becoming a pressing issue for more and more organizations everyday. As such, having an EMS as a constituent in most of the models for integration is a logic consequence of this importance (Karapetrovic and Willborn, 1998; Carraro and Leveque, 1999; Walker, 2000; Wilkinson and Dale, 2002, Rocha and Karapectrovic, 2005 and 2005b). However, this integration should be made with a clear understanding of the evolution of environmental management and the factors motivating such change.

Defining environment for management purposes is a complex task. In ISO 14001:2004, environment is defined as the "surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna and their interrelation" (ISO, 2004). However, this simplicity can be deceiving and defining environment for management purposes has proved all but simple. For instance, what are the boundaries of organization responsibility when talking about environmental issues? Environmental catastrophes such as the chemical spill in Bhopal (1984); nuclear contamination in Chernobyl (1986); and the oil spill in Alaska by the Exxon Valdez ship (1989) shows that boundaries can be huge in terms of location, financial impact, corporate image, and contractual obligation. Defining boundaries is one of many challenges environmental management is addressing nowadays.

How to manage environmental aspects is another area that has been evolving. The increasing rigidity of environmental legislation, joined with the lack of public trust in organization's environmental performance, has caused a change of approach, from reactive management to a more proactive approach: implementing full-bodied management systems.

2.8.2.2 Environmental Standards

Standards have played a key role for implementing and controlling environmental management systems. The first standard, BS 7750, published in 1992, was a national-wide, applicable only to UK organizations. Later, it became an international standard, called ISO 14001:1996 applicable to all ISO country members. This standard describes internationally agreed requirements for an EMS, structured around a Plan-Do-Check-Act cycle which has become a common structure for a number of management system standards.

ISO 14001:1996, which was later updated with minor changes in 2004, is the foundation for managing environmental aspects in an organization. In a similar vein than its ISO quality counterpart, ISO 14001 has been enhanced by a number of set of guidelines that describe specific elements. To such end, ISO has developed ISO 14000 series, with a total of 15 documents at the time of writing, to describe specific elements in an EMS like principles, systems and support techniques (ISO 14004:2004), environmental performance evaluation (ISO 14031:1999) or life cycle assessment (ISO 14040:1997). Also, ISO 14001 has served as springboard for a more rigorous and demanding environmental management standard, the Eco-Management Assurance Scheme (EMAS), published in 1995. This standard, applicable to organizations within the European Union, incorporates accountability requirements to the requirements set in ISO 14001 (Freiman and Schwedes, 2000; Poksinska et al., 2003), to make it more appropriate to the EU environmental philosophy. As a result, ISO 14001 registration has been awarded to more than 90,000 organizations worldwide (ISO Survey, 2004).

Part of this success of ISO 14001 may come from its potential to address issues that are not entirely within environmental issues but also are part of other stakeholders' requirements (Riemann and Sharrat, 1995; Pouliot, 1996). For instance, toxic waste is an environmental aspect that has also repercussions in health and safety of employees and, probably, in the final product, affecting quality. As such ISO encourages integration between related MSs by placing more emphasis on the compatibility of ISO 14001 with ISO 9001 (See general requirements and appendices in ISO 14001:2000). Furthermore, the main standard for an Occupational Health and Safety MS, OHSAS 18001, is also highly compatible since also follows the PDCA cycle. This call for compatibility and integration is but one of the aspects in the future of managing environmental aspects.

2.8.2.3 Future of Environment Management

ISO 14001 establishes the foundations for an EMS. However, new approaches, tools and techniques are necessary to properly address changes in environmental legislation (Miles and Munilla, 1995; Rondinelli and Vastag, 2000, Rusell, 2001), the need of real improvements, beyond mere compliance, to maintain a suitable living environment within the constraints marked by requirements of other stakeholders. A new approach that aims for a major integration of environmental aspects with overall organization's performance is the concept of Triple Bottomline (Elkington, 1999) where environmental performance is integrated along economic and social performance for a more holistic approach for measuring organization's overall performance. The social impact of environmental management is also explored in other line of development: sustainability. Organizations will be asked to manage its operations under a sustainable approach, which means that the environmental resources must be kept for future generations (Zairi, 2002). Although sustainability is still consider a philosophical principle, research is being conducted to elaborate a comprehensive framework to define, implement, measure and control how an organization is keeping environment for future generations. In summary, environmental management is and will be changing as a consequence of the market, society and technology modifications and innovations. Therefore, any effort for integration should consider such growth.

2.8.3 Occupational Health and Safety Management System

2.8.3.1 Evolution of Occupational Health & Safety Management

The third management system considered for integration, Occupational Health and Safety MS, looks for safeguarding the well-being of employees at the workplace. Obtaining the cooperation from employees is vital when integrating MSs and an OHSMS may help to obtain such participation.

Furthermore, avoiding accidents and other OHS hazards is important for organizations. According to ILO around 260 million accidents happen every year, each causing an average of 3 days absence (ILO, 2005). This is a significant loss in productivity, an increase of expenses in health insurance (Levine, 1997; Takala and Obadia, 1997; Redinger and Levine, 1998), overall indirect costs for hiring and training temporary personnel to fill for injured employees(Mearns and Havold, 2003), legal liability (BSI, 1999; and Keith, 2003) and an incalculable impact in the climate of affected companies. For all these reasons, managing health and safety at the workplace seems a good strategy to increase organization's competitiveness.

Although a relevant issue today, OHS position in organization's list of priorities depends on how it is understood by top management and its subsequent deployment into indicators and supporting management for implementing and controlling it. Understanding of OHS comes from how is defined. For instance, OHS has been defined as "absence of disease or accidents in workers" (WHO, 1946) or "conditions and factors that affect the well-being of employees, temporary workers, contractor personnel, visitors and any other person in the workplace" (BSI, 1996 in OHSAS 18001). The difference between definitions is highly identifiable and the consequences too. Two organizations, each with a different understanding of OHS, would end up with a different set of indicators to measure its OHS performance. For instance, a company that believes in the former definition of OHS would have as relevant factors: accidents and incidents (Mearns and Havold, 2003), fatality, injury and illness rates (Levine and Dyjack, 1997; Baker, 2001), lost-days rates (Arezes and Miguel, 2003). On the other hand, a company that implements the latter definition of OHS would have more proactive indicators to measure, besides the aforementioned, the following: results from risk identification, assessment and control (BSI, 1996 in OHSAS 18001), safety management, work force enrolment, risk attitudes, personal responsibility, safety rules violations and workplace physical environment (Mearns and Havold, 2003). While the first set of indicators creates a negative view of OHS as a "necessary evil", the second set of indicators encourages a sense of prevention and participation from employees, thus increasing the odds to keep the well-being of employees. The first definition, a traditional one, requires solely of a measurement program, while the second definition, a more proactive and comprehensive approach, entails to actually managing OHS rather than just measuring it.

2.8.3.2 Health & Safety Standards

As a result of this change of approach, the need for a system to manage OHS issues was identified and a number of standards have been published to meet such need. These standards are, in chronological order:

- AIHA OHSMS, presented by AIHA in 1996
- OHSAS 18001, published by BSI in 1999
- ILO-OSH, offered by ILO in 2001

No ISO standard for an OHSMS is currently available or will be in a near future, (ISO, 2003). This creates the need to decide, whether to select one of these three standards to represent the OHSMS requirements or to compromise between requirements to come up with a more comprehensive set of requirements that can represent an OHSMS into the integration process. A comparison between the three alternatives is done to choose which alternatives fit best for integration.

Each standard is measured against a set of eight characteristics to provide an overview of its applicability, supporting infrastructure, relevance, position towards integration and special requirements. The aspects examined are: applicability, existence of supporting guidelines, usage statistics, suitability to obtain registration, founding model, accountability, employees' involvement and approach upon integration (See table 2-4).

	AIHA OHSMS	OHSAS 18001	ILO-OSH
Aimed to	Organizations	Organizations	Generic Organizations plus requirements for governmental agencies
Supporting guidelines	None	OHSAS 18002-guidelines for implementation	None
Statistics	Not available	333 www.worldpreferred.com	Not available
Certifiable?	Yes	Yes	No
Based on	ISO 9001:1994	PDCA/ISO 14001	PDCA/ISO 14001
Accountability	No	No	Yes (Clause 3.3)
Worker's involvement	Yes	Yes	Yes
Encouraging integration	No	Yes	Yes
Comments		Incorporates a feedback loop based on performance measurement	

Table 2-4: Summary of OHS Standards

As expected all three standards have some points in common. For example, all are generic, applicable to any organization, although AIHA OHSMS is bound to American organizations in contrast to the remaining two that are internationally applicable. However, only OHSAS 18001 has a set of supporting guidelines for implementation OHSAS 18002. In terms of statistics, OHSAS 18001 is the only one found with some reliable information. However, this number may be higher. As a matter of fact, OHSAS 18001 is considered throughout the literature as the facto-international standard for an OHSMS. In general, OHSAS 18001 seems to be the best option for representing OHSMS requirements since is highly compatible to ISO 14001 and encourage integration among standards and involvement of stakeholders, namely, participation of employees. As a plus, OHSAS going beyond normal MS scope by including a feedback look to measure performance. Although no element is found about being accountable, this absence can be mitigated later when integrated with social responsibility requirements. Based on these considerations, OHSAS 18001 is selected as a suitable standard to describe requirements for an OHSMS to be integrated with other MSs.

2.8.3.3 Future of Health & Safety Management

Additional to the evident need for cutting health care and related expenses that are burdening organizations, internal pressure from employees, trade union and communities will lead to a more systematic approach towards OHS, beyond the mere compliance with legal regulation (Laws, 2002; Pun et al., 2003). Integration with the overall business management system and other functional related systems is seen as a necessity by practitioners and standard developers alike. This can be accomplished by integration among management systems (Beckmerhagen et al., 2003; Jonker and Karapetrovic, 2004) or by linking OHS with overall organization's performance, e.g. Balance Scorecard (Mearns and Havold, 2003).

2.8.4 Corporate Social Responsibility Management System (CSRMS)

2.8.4.1 Evolution of Social Responsibility Management

Social Responsibility is an ambiguous concept used interchangeably with other concepts such as "Accountability" (ISEA, 1999), "Social Accountability" (SAI, 1999) and "Social and Ethical Accounting, Auditing and Reporting" (Zadek, 1998). Although no universally agreed definition on CSR exists yet, possibly because of its high subjectivity content, some common ground can be found. For instance, all definitions seem to be highly related to the ethical behaviour of an organization (Buchholz, 1991) and the individuals composing it (ISEA, 1999). Social and ethical issues are usually considered as part of organization's social responsibility (ISEA, 1999; SAI, 2001; SAI, 2003) and they are closely tied up to specific stakeholders (ISEA, 1999; SAI, 2003).Thus, CSR may be defined as "social and ethical concerns towards organization's stakeholders beyond the minimal legal obligations as a consequence of organization's operations and performance". However, to be applicable and useful for the organization and stakeholders, an operational definition is required, namely, what are the social and ethical issues.

Social and ethical issues for an organization are defined according to its stakeholders and their relative significance. For instance, the Social Accountability Institute (SAI) has defined CSR in terms of labour rights for employees: child labour, forced labour, health and safety, freedom of association and right to collective bargaining, discrimination, disciplinary practices, working hours and remuneration (SAI, 2001). Environment is also part of social responsibility, i.e. environmental performance (Lantos, 2001). Shareholders are considered part of organization's social responsibilities, especially after financial scandals like those of Enron and WorldCom (Stimson, 2005), and, in a more broad sense, society at large: contribution to community development, philanthropy and accountability (Lantos, 2001). However, the proper combination of social and ethical issues for each organization as well as their minimum levels of performance expected depends ultimately on geographical and cultural factors. This subjectivity is the trademark of CSR, bringing the need for standardization to define common ground.

2.8.4.2 Corporate Social Responsibility Standards

In the last decade, a number of codes and management models for social responsibility have been developed. Some define values and principles for organizations: GRI, the Ethical Trading Initiative and the Caux Round Table's Principles for Business (Castka et al., 2004). Although important, further work is usually required to anchor and embed such principles along the organizations' operations (Gobbels and Jonker, 2003). As a consequence, a number of standards describing a CSR management system have been published:

- Social Accountability (SA 8000) published by SAI in 1999
- AccountAbility (AA 1000) issued in 2001 by ISEA

- AS 8003 offered in 2003 by the Standards Australia

The first two are international standards while the third standard is bound to Australian organizations. More national standards have been released in France, Spain, Brazil and other countries. However, only AS 8003:2003 is included as representative of a national CSR standard. In the international arena no ISO CSR standard is yet offered, although a committee is actually working writing a draft, which is expected to be released in 2008 (ISO, 2004). As such, an analysis of these three standards is required to select which one is better suited for integration purposes.

However, analyzing CSR standards is not as straightforward as for OHS standards (See previous section). Because of the diversity among CSR concepts, levels of responsibility and accountability advocated, and engagement of stakeholders, two examinations are performed. The first identifies stakeholders addressed by the standards, what their requirements are, the levels of engagement and accountability established. Table 2-5 illustrates the result of this first analysis.

A second analysis looks more into how the management system and its elements are described. To do so, a framework based on a Plan-Do-Study-Act cycle is defined. Table 2-6 shows the results of the management system elements

Based on these two comparisons, AA 1000 is selected as the most suitable international CSR standard for integration purposes. Its scope is broad enough to satisfy a significant number of stakeholders including employees, environment, shareholders, and society at large in a broad base of requirements. AA 1000 also encourages stakeholder engagement by promoting accountability along organization's performance. Integration will indeed require of strong participation of involved stakeholders and AA 1000 has the right approach towards it. On the other hand, AA 1000 does have some shortcomings. For instance, it falls short when addressing resources for the system, although it is strong on resources for auditing activities. However, this lack of guidelines for allocation and deployment of resources can be filled out when integrated with more fully-resource fledged standards such as ISO 9001:2000 or ISO 14001:2004

SA 8000	AS 8003	AA 1000	Comparison
Corporate Social Responsibility Driver			
Based on human rights, it focuses on labour and workplace conditions. Stakeholders implicated in this endeavour are workers, employers, unions, government and NGOs.	It is centred on ethical culture, providing a flexible approach to organizations for defining and prioritizing their stakeholders. Employees, government, stockholders and community are mentioned as main stakeholders.	It is geared towards the management of social and ethical accounting, auditing and reporting processes. Stakeholders may include owners, trustees, employees, customers, government, regulators, NGOs and the community.	The standards have different approaches underlying their drivers. While SA 8000 is mainly aimed to labour rights, AA 1000 emphasises the accountability to broad base of stakeholders. The Australian Standard AS 8003 is focused on the ethical culture for a broad range of stakeholders.
Issues of Corporate Social Responsibility			
SAI has selected the following issues: Child labour, forced labour, health and safety, freedom of association, right to collectively bargain, discrimination, disciplinary practices, working hours and remuneration	Targeted issues are: Profitability, governance ethics, employee and supplier issues, health and safety, impacts on the host community and the environment, regulatory compliance systems, plus other issues identified through stakeholders' engagement	The following categories: organization's values and governance, regulation and controls, marketing, accountability, human rights, labour and working conditions, investment impact, as well as the impacts on other species and environment	In considering the issues for CSRMS, AA 1000 and the AS 8003 share common ground. Similar stakeholders and related requirements are targeted. On the other hand, SA 8000 provides a narrower overview limited to working conditions.
Stakeholders' engagement			
Although this element is not explicitly mentioned, SA 8000 states that an organization "shall appoint a management representative together with a non-management representative to facilitate communication on related issues" (sections 9.3 and 9.4).	Section 3.1 establishes the necessity of engagement of stakeholders for managing environmental and social impacts. Furthermore, in section 5.2.9, AS 8003 proposes a face-to-face dialogue and a stakeholder consultation committee.	Stakeholders' engagement is a cornerstone of this standard. It has been addressed as a commitment for stakeholders' engagement (section 1.5), techniques for getting such engagement (section 3.4), involvement in the recollection of information (sections 7.2 & 7.6), targets and indicators (8.8 & 8.9), reports and feedback (11.2)	Stakeholders' engagement seems to have been considered in all three standards. SA 8000 mentions the participation of employees for the management of the system, AS 8003 offers two methods for engaging stakeholders in the process and AA1000 offers a comprehensive and fully explained approach for engaging the stakeholders in social and ethical issues
Accountability			
Section 9.12 establishes the necessity of outside communication of the results of management reviews and monitoring activities.	As a maintenance element, section 4.6 states the necessity for an appropriate reporting system of CSR performance and benchmarking against best practices.	Sections 9, 10, 11 and 12 state elements for report preparing, report auditing, report communication and feedback, and systems for preparing them. Indeed, accountability is a core value here.	AA1000 provides a complete notion of accountability in social and ethical issues. SA 8000 barely mentions accountability as an element for external communication. Finally, AS 8003 considers accountability but lacks of deepness in building proper management elements

Table 2-5: Comparison of general features of CSR standards

SA 8000	AS 8003:2003	AA 1000
	Planning a CSRMS	
Requirements such as policy, management review and company representatives are part of the planning process, being mentioned in sections 9.1, 9.2, 9.3 and 9.4. In section 9.5, SA 8000 mentions a listing of planning activities such as: • Definition of roles, responsibility and authority • Training • Continual monitoring of activities and results	Planning of a CSRMS is addressed in sections 2 and 3 : • Policy (2.2) • Management responsibility (2.3) • Continuous improvement (2.5) • Identification of CSR issues (3.1), • Transparency (3.9), • Stakeholder engagement (3.10), • Policy and procedures on business ethics (3.12)	The main activities considered as part of the planning process are: • Establishing commitment and governance procedures (1) • Identifying stakeholders (2) • Defining and reviewing values (3) • Identifying issues (4) • Determining process scope (5) • Identifying indicators (6)
	Implementing a CSRMS	
SA8000 mentions, with scarcity of details, the implementation of a CSRMS. Allocation and deployment of resources are mentioned in: • Company representatives (9.3 & 9.4) • System planning and implementation (9.5)	The Australian proposal describes a three-layer deployment for a CSRMS. For that reason, implementation goes through all three layers, which implies structural, operational and maintenance elements, namely: • Resources (2.4) • Operating procedures for CSR (3.2) • Implementation (3.3) • Feedback system (3.4) • Education and training (4.1) • Visibility, communication and influencing (4.2).	For implementing a CSRMS AA1000 states a number of requirements, such as • Methods of engagement and collecting of information (7.2) • Selection of methods for gathering information (7.3) • Influencing factors for information selection (7.4) • Auditor selection (10.3) • Auditor level of confidence (10.18) • Quality Assurance (10.19 - 10.21) • Cooperative systems and controls (12.7) • Management information system integration (12.11)
	Operating a CSRMS	
A number of requirements are addressed in SA8000 for CSRMS operation. • Evaluation and selection of suppliers/subcontractors (9.6) • Suppliers and Subcontractors Records (9.7) • Evidence of system performance (9.8) • Homeworkers' protection (9.9) • Addressing stakeholder concerns (9.10) • Records (9.14)	At the time to operate a CSRMS, several elements should be included as part of the minimum requirements set by this standard: • Operating procedures for CSR (3.2), • Management Supervision (3.11) • Monitoring and assessment (4.3) • Review (4.4) • Liaison (4.5) • Accountability (4.6) • Third party verification (4.7)	Processes for auditing and reporting on social and ethical issues Collect information (7) Analyse information, set goals and develop improve. plan Prepare reports (8) Report accessibility (11.4) Report features and structure (11.5) Data collection and documentation systems general (12.8) and scope (12.9) Social and ethical documentation (12.10)
	Control and improvement of a CSRMS	
SA8000 prescribes some minimum requirements such as: • Evidence of system performance (9.8) • Taking corrective actions (9.11) • Access for verification (9.14)	AS 8003 addresses some elements in this area: • Continuous improvement (2.5) • Feedback system (3.4) • Review (4.4) • Third party verification (4.7)	AA1000 describes the following elements: • Audit Reports (10) • Communicate reports and obtain feedback (11) • Establish internal review/audit process objectives (12.12) and system (12.13) • Principles in internal review/audit (12.14)

Table 2-6: Comparison of Management Element of CSRMSSs

On the other hand, just a handful of literature on CSR addressed empirical evidence about the performance of CSR models. This lack of information resides mainly from the relatively recent relevance on CSR in organization's agendas and, in the other side, the lack of agreement in what CSR means. Some improvements in corporate financial performance were found from social and governance issues of CSR (Gompers et al., 20003; Orlitsky et al., 2003). However, some studies shown no statistical significant evidence of improvement as a consequence of CSR (Diltz, 1995; Sauer, 1997). For some companies, perhaps those benefits are more subtle and will appear over a long timescale (Cooper, 2003).

A number of benefits have been perceived from the implementation of those initiatives, including both codes and MS standards:

Some drawbacks have been mentioned from implementing CSR:

- Main criticism, being used only as PR tool or good advertisement. (Frankental, 2001; Idowu & Taylor, 2004)
- Decrease on stakeholders appreciation due to difference between perceptions and CSR reports (Cooper, 2003)
- Lack of control, standardization and verification on CSR reporting (Frankental, 2001; Idowu & Taylor, 2004)

2.8.4.3 Future in Social Responsibility Management

Undoubtedly, this is the newest of the four MSs addressed here. Its embryonic stage and the complexity of the targeted issues and applied methods have played an important factor on its development. However, CSR is expected to increase its impact around the world as a consequence of developments in laws, international trades and agreements, and more awareness from society and communities in general. For example:

- New regulations: Financial frauds such as Enron and World Com have led to the Sarbanes–Oxley Act (USA) for corporation accountability.
- New MS standards: ISO has announced an upcoming release of ISO 26000, a CSRMS standard. Also, AcountAbility is updating AA1000 framework.
- New approaches: ISO 9001:2000 has been proposed as a mean to comply with the Sarbanes-Oxley Act, an American initiative for regulating financial responsibilities of organizations (Smitson, 2005).

- Better performance framework to measure how CSR would increase customer loyalty (Girod and Brayne, 2003; Idowu & Taylor, 2004), appease user groups and better support from communities (Schaltegger et al., 1996; Idowu & Taylor, 2004), recruit and retain talented employees (Idowu & Taylor, 2004), improve quality and productivity (Rohitratana, 2002), and avoid potential financial, ethical and social risks (Idowu & Taylor, 2004; Capaldi, 2005)
- Major awareness and society pressure. Formalization of movements such as Fair Trade, Human rights, etc.

2.8.5 Auditing of Standardized Management Systems

MS Standards are guidelines for implementing functional–related MSs that will demonstrate to particular stakeholders that an organization is fully prepared to satisfy its needs in a continuous basis. However, demonstrating such capability is not easy and standard developers expect to do so through a registration process. To be registered, an organization must pass a full-system third-party audit followed by regular audits to maintain such registration, thus assuring its capability to stakeholders. This fact makes auditing a relevant element in the implementation and maintenance of standardized MSs. Consequently, the following section is devoted to describe evolution of auditing within management systems, lines of future development, and its possible role with integration.

2.8.5.1 Evolution of Auditing

Performing audits is part of the regular activities for implementing and maintaining a management system. However, this concept was borrowed, along with a set of principles, procedures and resources, from the financial management field. Traditionally, auditing is a financial technique aimed to provide assurance to management, owners and government of the reliability, fairness, completeness and other characteristics of financial statements. As such, auditing intends to fill out the gap between the processes, in this case, accounting and financial, and the involved stakeholders, that is, management, owners or government. From this traditional application, auditing principles, methods and requirements, developed in this initial application, were later applied to other areas of management, looking to repeat its initial success (Willborn, 1994). The objective for both applications, in financial and management systems, has been the same: to build a bridge of trustiness and reliability between 'doers' and stakeholders.

The body of knowledge of financial audit is being transferred, although not entirely (See Karapetrovic and Willborn, 2000b and 2001b for further elaboration), to create audit programmes for individual management systems. This level of transference depends almost entirely on the development of management system standards. This is because auditing in general requires two set of criteria: one for the auditing process and one describing the MS being audited. For instance, in financial management the first set applies to the financial statements being examined, i.e. the Generally Accepted Accounting Principles (GAAP) while a second set applies to the auditing process itself, i.e. the Generally Accepted Auditing Standards (GAAS). Similarly, two sets of criteria are also required for any functional management system audit.

Quality was the first functional management area mature enough to adopt the audit format for assurance purposes. In 1981, the Canadian Standards Association (CSA) published CAN3-Q395-81 – Quality Audits, the first nationwide set of guidelines for auditing a Quality ~~Management~~ System. This set of requirements was to be used to verify organization's QMS compliance against CSA Z999. The requirements of two set of criteria was then met and auditing was possible. From such point in time, auditing has been extensively used in a number of management systems when standardized requirements are developed and agreed upon, i.e. environmental, occupational health and safety, social and ethical responsibility (Vinten, 1998; Karapetrovic and Willborn, 2001b). This expansion will be described in more detail in the next section. On the other hand, besides this lateral growth to other management systems, auditing has also evolved in depth, changing in scope, purpose and processes, mostly in the quality arena, to be adapted to organizations' and stakeholders' specific requirements.

In the first guidelines for auditing a quality program, CAN3-Q395-81, audit was defined as "*a human evaluation process to determine the degree of adherence to prescribed norms (criteria, standards) and resulting in a judgement*" (CSA, 1981). Spanning over two decades, the auditing concept has changed several times, which in turn, has affected also the scope, purpose and processes required to do it. These changes have been addressed in several auditing guidelines, mostly quality related, from national and international bodies. ISO 19011, the latest and current standard embodying requirements for a quality audit, states that "*a systematic, independent and documented process for obtaining audit evidence and evaluating it objectively to determine the extent to which* *audit criteria are fulfilled*' (ISO, 2002c). When comparing these two definitions, some insights on evolution of auditing within management systems theory may appear. For example, the mechanism of assessment has changed from 'human evaluation process' in the Canadian initiative to 'systematic, independent and documented process for obtaining…and evaluating' in the latest ISO guidelines. By adding elements such as systematic, independent and documented, auditing is being structured in ISO 19011 around its main principles. The output of an audit has also been redefined, from 'degree of adherence…resulting in a judgment', in CAN3-Q395-81 to 'extent to which audit criteria are fulfilled' in ISO 19011. While in the former statement, compliance is the underlying notion, in the latter declaration the concept of auditing effectiveness is included. Nevertheless, increasing claims are being made to change the audit concept to a more value-added definition that will serve to identify strengths and weaknesses of a company, thus contributing actively to the continuous improvement of the system (Beecroft, 1996; Williamson et al., 1999; van der Wiele et al., 2000; Karapetrovic & Willborn, 2001; Liebesman, 2002; Balbaster et al., 2005)

2.8.5.2 Standardizing Auditing

As mentioned before, two set of criteria are needed to perform an audit. Developing standards of particular management systems provides one of such set of criteria, setting the pace for elaborating complementing auditing criteria. Similar approaches taken to develop system standards are laterally transferred to the structure of the auditing criteria.

In 1987, ISO developed ISO 9000 to describe elements of a QMS but it was until the 1994 versions, i.e. 9001, 9002 and 9003, that this initiative really took off. To support it, ISO published ISO 10011 in 1990 which was used to audit QMS against both ISO 9000 versions. ISO 10011 was, in fact, a three-document set of guidelines: ISO 10011-1, 10011-2, and 10011-3 for quality audit procedures; quality auditor's requirements and managing quality audit programs respectively.

In 1996, an international standard for environmental management, ISO 14001 was introduced, supported by guidelines for environmental audit, described in three documents: 14010 for general principles of environmental auditing, 14011 for audit procedures and 14012 for qualification criteria for environmental auditors.

In 1999, OHSAS 18001, introduced by the BSI, described requirements for an Occupational Health and Safety MS. Due to its structure, highly compatible and aligned to ISO 14001, OHSAS 18001 could be audited using ISO 10011 as the auditing criteria. Also in 1999, the Institute of Social and Ethical Accountability (ISEA), published AA 1000, describing a set of requirements for a CSRMS as well as audit principles (Section 3.4 – AA 1000) audit procedures (Section 3.5 – AA 1000), and competence and qualifications requirements for social and ethical auditors (Section 8 – AA 1000)

In 2002, a significant event occurred in the auditing field. ISO produced ISO 19011, which are guidelines for quality and environmental management systems auditing. This document superseded ISO 10011 and 14011, integrating all six documents into four different sections describing: general principles of auditing, managing an audit programmes, auditing activities and competence of auditors. To do so, alignment and harmonization among similar requirements was performed leaving functional specific elements separated yet joined within those four sections. For instance, competence of auditors is divided in auditing competences (similar) and quality and environmental specific competences (separated). This alignment and harmonization between requirements for auditing sets a precedent towards integration (Beckmerhagen et al, 2003b). As such, ISO 19011 is currently used for auditing environmental (ISO 14001), quality (ISO 9001) and all its derived standards and occupational health and safety (OHSAS 18001).

Undoubtedly, the development from ISO of an integrated set of guidelines for auditing quality and environmental management systems has created a spur for integration. However, auditing is still growing up and several lines of development can be visualized.

2.8.5.3 Future for Auditing

Driven by the development of management theory and practice, auditing is facing new challenges, which can be clustered in the following categories:

a) Quality audit – It has been defined usually in terms of probability, but no agreement has been done on which aspects to measure. For instance, DeAngelo (1981) and Wooten (2003) have defined it as “the market-assessed joint probability that a given auditor will both discover a breach in the client’s accounting system and report the breach”. This definition, taken from the accounting system (Deis and Giroux, 1992), may be broadened to cover any kind of system. Perception and reality are also considered as elements of audit quality in the concept shaped by Watkins et al (2004): audit quality is formed by auditor reputation (perceived competence and independence) and by auditor monitoring strength (auditor competence and independence). Finally, although not specifically defining audit quality, Karapetrovic and Willborn (2000) have suggested an alternative method, i.e. to measure the effectiveness of an audit. They defined audit effectiveness as the "joint probability that an audit will be suitable, reliable and available". All these definitions can be applied to any audit, regardless of its object of assessment. A combined definition should embrace audit ability for detection and reporting of breaches in the system, perception and real ability of auditors as well as the effectiveness of the auditing process.

For the purposes of the auditing of an IMS, audit quality is defined here as "the joint probability that an audit is suitable, reliable and available to detect, report and act on the breaches of a management system". In the same vain of quality for operating processes, audit quality is not absolute and depends both in internal indicators, which provide the inside view of the auditing performance, and the perception of stakeholders, which provide the outside point of view of the stakeholders. Defining audit quality is expected to provide some guidance when selecting those factors most likely to improve the performance of the auditing process.

The literature on audit quality is, by no means, large and is mainly focused on financial audits. However, there are important issues addressed in those publications, mainly concerned to the auditors' competence, their degree of independence and credibility to perform auditing in the current market (Medori and Steeple, 2000; Dittenhofer, 2001; Karapetrovic & Willborn, 2001; Balbaster et al., 2005), audit procedures to maintain consistency in results, proper balanced between internal and external audits, connection between internal and external audits and lack of ability to measure efficiency and continuous improvement (DeAngelo, 1981; Hogan and Jeter, 1999; Karapetrovic and Willborn, 1998 and 2000; Bou-Raad, 2000; Johnstone et al., 2001; Rezaee and Sharbatoghlie, 2001; Wooten, 2003; Ni and Karapetrovic, 2003; Berckmerhagen et al., 2003 and 2004; Johnson, 2004; and Watkins et al., 2004).

b) Integration of auditing – Following the appearance of ISO 19011 integration of auditing guidelines for more management systems, such as those of accounting, finance and software, are being considered (Karapetrovic and Willborn, 1998; Beckmerhagen et al., 2004).

After ISO 19011:2002 was released auditing is setting the pace towards integration of quality and environmental management systems, at least. In addition, ISO is currently engaged developing the concept of Integrated Use of Management System Standards (IUMSS) which will be released in the form of a handbook in 2006. Interest towards integration has also been expressed by registrars (Wilkinson and Dale, 2002). Most of the registrars are offering a variety of services for integration of management systems: training for implementing and auditing an IMS, i.e. BSI, CSA, and QMI; and certification services of an IMS, i.e. SGS, BVQI and QMI. In summary, integration of standardized management systems is an interesting and valuable topic within the management field with many benefits to offer but also many challenges to overcome.

2.9 Motivation

Integration of management systems is an incipient line of development for both practitioners and researchers alike. As described in the survey, there exists an increasing interest from the business community, shared by standards developers and registrars, towards integration of standardized management systems that will eventually improve organization's performance in meeting their stakeholders' requirements.

An increasing amount of work is being done in this topic (See Wilkinson and Dale, 1999 and 2002; Beckmerhagen et al., 2004 for further information). As described in this section, ISO is currently working in integration and higher compatibility of its main MSSs, ISO 9001 and ISO 14001, with a two-headed approach. Also, some models have been developed by quality authors to illustrate integration of particular combinations of management systems. Related topics such as management auditing, organizational culture, alignment and harmonization have also been explored as constituents of either the implementation process or as element of the resulting integrated system. However, there are still a need for further research, specially for developing the conceptual structure to support current initiatives for integration that are being developed by organizations on their own, by registrar companies as part of their services offered to business, and by standard developers to satisfy organizations overall at national and international levels.

From the business community point of view, the reasons for engaging in research to create conceptual structures to facilitate integration are:

- To facilitate organization's comprehension about the potential benefits of integration along with the work and resources required to do it.
- To provide organizations with a sound conceptual framework for integration thus attracting them to embarking in such endeavour. This conceptual framework should include, at least, a model and a methodology (Jonker and Karapetrovic, 2004)
- To ensure the conceptual framework facilitates a flexible implementation process, tailored to organization's own needs such as their size, e.g. SME, and applicable regulations, e.g. strong environmental regulations.
- To include, in the scope of the resulting system, MSs that reflects current and potential requirements of organizations worldwide.
- To explore the possibility to use integration as a stepping stone towards excellence for relatively new organizations in the implementation of standardized management systems.
- To identify and include into the integration process enablers for reducing time and administrative costs, including registration, for implementing consecutive MSs in an integrative system.

From the academic standpoint, incentives for developing a conceptual structure for integration are:

- To fulfill an identified need for models, describing integration of standardized management models, flexible in scope and implementation process and can truly integrate, rather than merely align, MS requirements.
- To provide a conceptual base for current work in progress aimed to attain integration between ISO 9001 and ISO 14001. As it stands ISO and National Standard Bodies are having a hard time to agree on the best approach for integration (ISO, 2005). Part of the reasons is the lack of conceptual and empirical research done to explore different alternatives for modelling the system, the levels of integration and the paths for implementation.
- To provide a systematic analysis on integration of standardized management systems, including their elements and the methodological tools required. Although at least four IMS models have been identified in the literature, none of

them is supported by a thorough analysis to identify suitable criteria for integration of MSs and consequent deployment into organization's structure.

- To develop an integrative approach that facilitates integrating management systems and enhances its performance by adding new management systems or specific management elements, by improving overall levels of stakeholders' satisfaction, or by fortifying existing levels of integration.
- To explore the inclusion of a MS aimed to a growing yet incipient group of stakeholders such as Corporate Social Responsibility, which has never been formally included for integration.
- To develop auditing as an essential control element for integration and exploring its potential in a new context such as an integrated management system.

2.10 Objectives

Based on the reasons supporting this research, the following research objectives are defined as follows:

1) Design a conceptual structure for integration of four standardized management systems: environmental, occupational health and safety, quality, and social responsibility. Flexibility in scope and sequence of integration should be considered as critical requirements for the conceptual framework. This conceptual framework will include:
    a) Design a model describing elements and supporting approaches for integration of selected standardized MSs.
    b) Design a methodology, linked to the integrative model, showing to organizations a suitable implementation path, leading them from different organization-specific starting points to an organization-specific IMS.
    c) Design an auditing framework to support implementation and improvement of an IMS, based on potential new roles of this assessment tool.
    d) Develop guidelines for the model and supporting methodologies, providing detailed descriptions for the whole conceptual framework.
2) Verify the value and feasibility of implementation of the IMS model indirectly through a survey applied to members of ISO/TC 176, the Canadian committee for

quality in ISO; their feedback will be addressed and necessary modifications included into the IMS model.

3) Simulate the implementation of an IMS in two different organizations to validate, with real-life data, assumptions made in the design stages. The assumptions to be validated are: adaptability to different starting points, sequences of integration, organizational contexts and stakeholders' requirements.
4) Discuss potential differences for implementing an IMS with the same scope, EMS plus QMS (in alphabetical order), in two different contexts and looking to meet different requirements of similar stakeholders.

3. Defining Research Methodology

3.1 Introduction

This chapter describes the methodology directing the entire research, illustrating two main purposes:

1. Design a conceptual framework for integrating standardized management systems (MSs)
2. Validation of the conceptual framework

3.2 Overall Research Methodology

The research methodology, illustrated in Figure 3-1, starts by identifying the current development of conceptual and empirical knowledge in integration of management systems. Specific necessities are identified and defined as research objectives; basically, the need for an Integrated Management System (IMS) model along with supporting methodologies for implementation so an organization may use them to integrate both currently working and additional MSs within a pre-established four standardized Management Systems (MSs) scope (See Section 2.8 of the literature survey).

To assist the conceptual design process, the Quality Function Deployment (QFD) technique is modified looking to produce the conceptual framework elements required to integrate the selected standardized MSs. This technique brings robustness into the design ensuring integration between the elements within the IMS model and between the IMS model and the developed implementation methodologies.

Next, the conceptual framework for integration of MSs is created in three different steps that are kept consistent through applying the QFD approach. First, an IMS model is developed as result of the First and Second House of Quality of the QFD. Based on the resulting IMS model, an IMS implementation methodology is then generated to guide organizations to implement an IMS. Complementing the IMS conceptual framework, the third step develops an IMS auditing system to augment IMS assessment capabilities and built upon the same IMS model structure. As a complementary system, this auditing system should also evolve, in terms of objectives and procedures, to support the implementation of an IMS along different levels of maturity.

A verification point is included within the IMS model design process. During the design process, an IMS model, generated through an analysis of current knowledge of management systems and integration issues is validated. To do so, a survey is applied to a Canadian group of quality experts and the obtained feedback is introduced into the IMS model, resulting into a comprehensive and understandable model: the IMS "Motor" Model.

Finally, a validation process is included to test some assumptions supporting the whole IMS conceptual framework. The assumptions to be validated are: IMS conceptual framework ability to address different starting points and sequences of integration along with its applicability to different contexts and stakeholders' requirements. To perform this validation two companies are selected and their management characteristics analyzed. These companies are chosen because they hold ISO registrations, one of them is ISO 9001 and the other is ISO 14001 thus illustrating different starting points and sequence of integration. Then, each company simulates implementing an IMS from their registered MS to have an IMS for quality and environmental requirements in both companies. By having the same finishing point IMS, each simulated IMS will validate IMS ability to work with different organizational contexts and stakeholders' requirements.

Finally, conclusions are formulated, highlighting research contributions, problems encountered, modifications needed and future venues of research in integration of management systems.

3.3 Defining Research Objectives

An extensive literature survey, shown in Chapter Two, gathers existing conceptual and empirical knowledge on integration of management systems. This survey collects and analyzes current development of management systems integration knowledge, existing IMS models, and management systems suitable for integration; potential benefits, obstacles and shortcomings are weighted for each of them in general and within an integrative framework in particular. As a result a number of gaps are identified as related

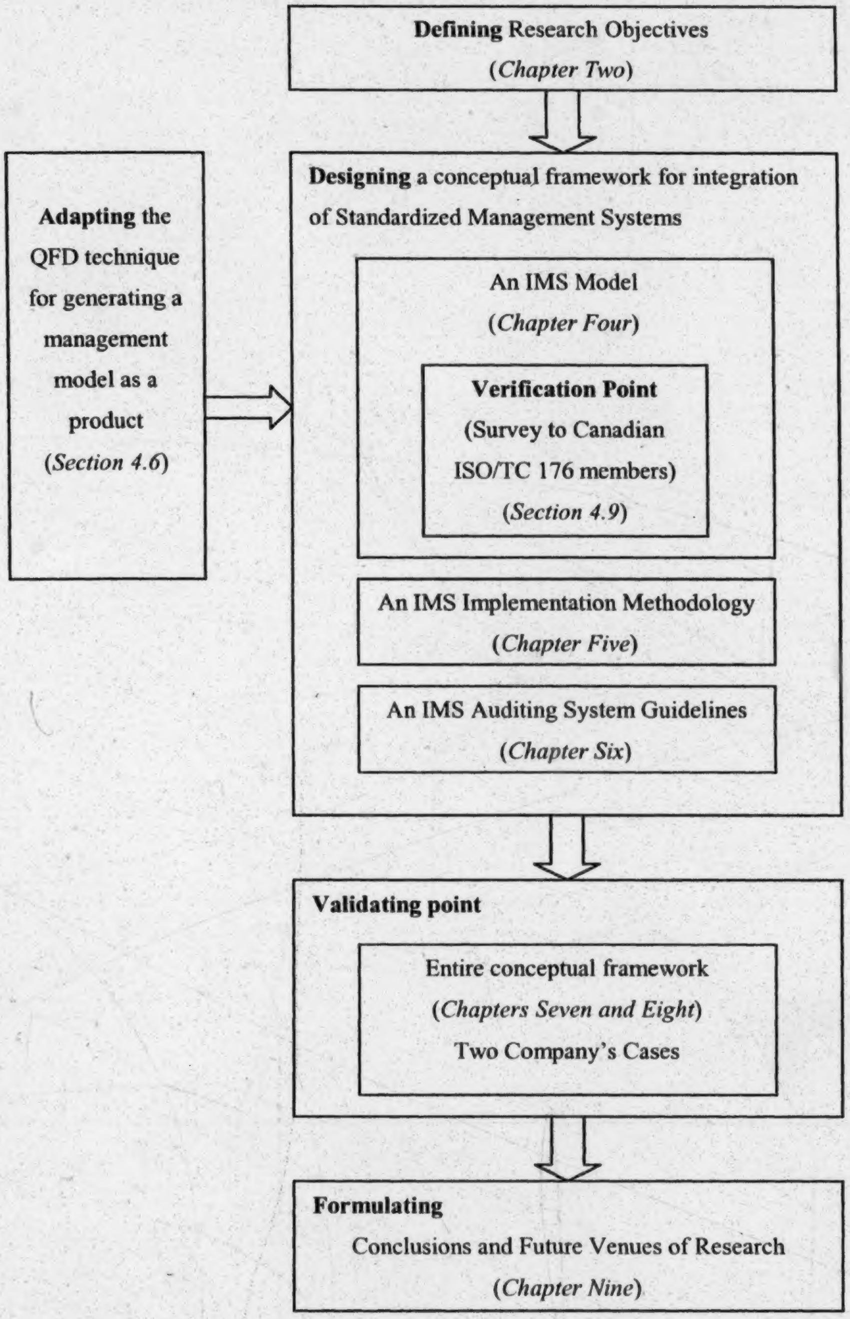

Defining Research Objectives
(*Chapter Two*)
Adapting the QFD technique for generating a management model as a product
(*Section 4.6*)
Designing a conceptual framework for integration of Standardized Management Systems
An IMS Model
(*Chapter Four*)
Verification Point
(Survey to Canadian ISO/TC 176 members)
(*Section 4.9*)
An IMS Implementation Methodology
(*Chapter Five*)
An IMS Auditing System Guidelines
(*Chapter Six*)
Validating point
Entire conceptual framework
(*Chapters Seven and Eight*)
Two Company's Cases
Formulating
Conclusions and Future Venues of Research
(*Chapter Nine*)

Figure 3-1 : General Research Methodology

to either the model to represent integration or to a supporting methodology. From the literature, the relevance of integration of management systems is properly characterized as beneficial from practitioners and researchers standpoint. As a consequence, a set of seven research objectives are defined to steer the entire research looking to generate a sound, comprehensive and understandable IMS conceptual framework.

3.4 Adapting the QFD for Generating Integration Elements

To assist in the conceptual framework design, ensuring robustness of design and continuity between model and methodology, the QFD technique is adopted and adapted to the particularities of this application. This suitability is achieved by considering stakeholders and the organization itself as costumers of the IMS and a management model as the QFD output rather than its common output, i.e. a product or service. Further considerations in terms of regular QFD designed product and production processes are shown in Section 4.6

3.5 Designing a Conceptual Framework for Integration

As identified in the literature survey, a model and a set of supporting implementation methodologies are required to guide the integration of standardized management systems in a given organization. Therefore, the research objectives focus on designing an Integrated Management System (IMS) model, an IMS implementation methodology and an IMS auditing system guidelines.

3.5.1 Designing an IMS model

An IMS model is developed in Chapter Four, containing a graphical representation of its elements and interactions and detailed descriptions of each element and corresponding requirements. To create this model an auxiliary, more detailed methodology is followed as seen in Figure 3-2 where the numbers are actual references to sections in the thesis. First a framework for reference is developed to define and recognize an IMS and its possible lines of development. Next, the IMS scope and purpose are outlined according to an all-encompassing approach of the four selected MS Standards. From such scope, stakeholders' requirements are identified and their interactions analyzed giving as a result a set of requirements to feed the modified QFD technique.

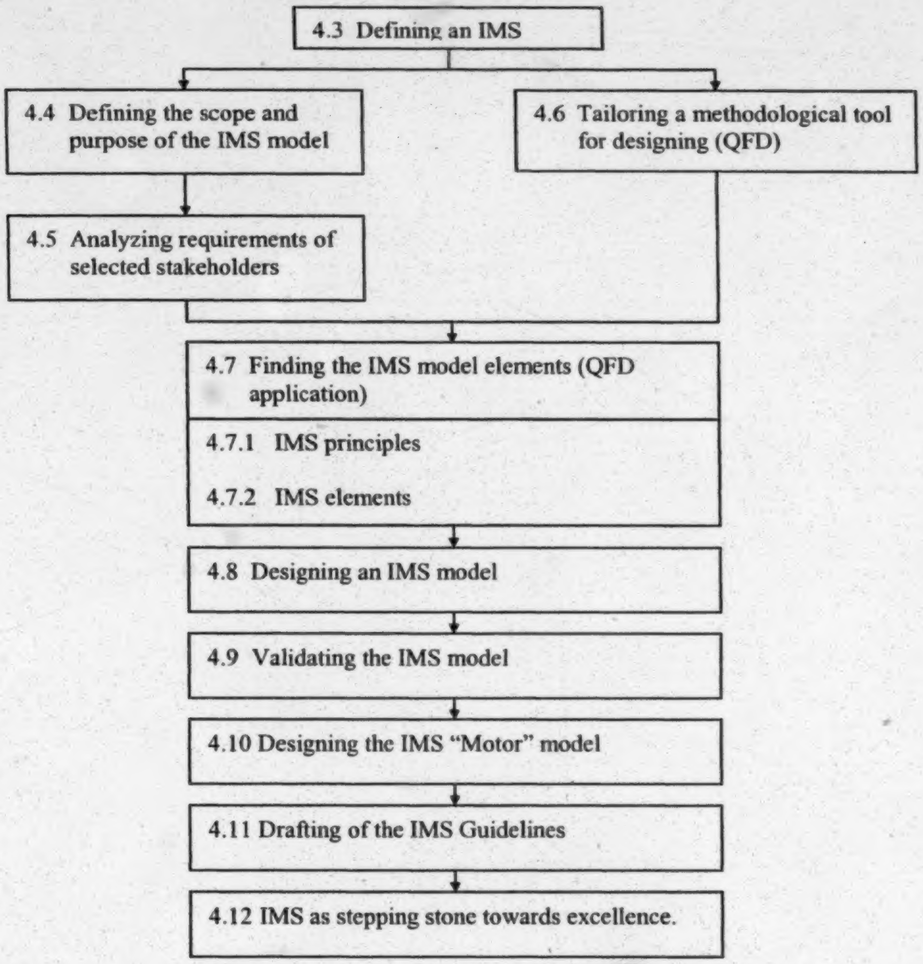

4.3 Defining an IMS
4.4 Defining the scope and purpose of the IMS model
4.6 Tailoring a methodological tool for designing (QFD)
4.5 Analyzing requirements of selected stakeholders
4.7 Finding the IMS model elements (QFD application)
4.7.1 IMS principles
4.7.2 IMS elements
4.8 Designing an IMS model
4.9 Validating the IMS model
4.10 Designing the IMS "Motor" model
4.11 Drafting of the IMS Guidelines
4.12 IMS as stepping stone towards excellence.

Figure 3-2: Procedure for Designing an IMS Model

Later, two Houses of Quality are generated by applying the tailored QFD technique. The first House defines a set of IMS principles that will guide the design and implementation process while the second House finds the actual IMS model elements. It is from these elements that a resulting IMS model is configured and populated with specific management requirements. To do so, a set of criteria for alignment, harmonization and integration of standard specific requirements is developed looking for an all-encompassing approach and deployed into an IMS model proposal. A verification point is included at this point, testing value and feasibility of this resulting IMS model through a survey applied to Canada ISO/TC 176 members, a group of Canadian quality experts, producing relevant feedback (See section 3.5.2 for further elaboration). This feedback is then analyzed and proper modifications accepted, creating the IMS "Motor" Model, which uses an analogy with an electric motor to help visualizing the interactions between the system elements. This model is deployed into sub-elements and requirements that encompass all standardized requirements. Finally, a comparison between the IMS and a Business Excellence Model (BEM) is performed to test IMS the feasibility of the IMS as stepping stone towards excellence.

3.5.2 Verification of IMS Model.

The IMS "Motor" model is the product of a series of three subsequent IMS models, each one with particular changes in terms of elements and configurations trying to find a suitable approach for integration. Model number two (See at the end of Appendix B-1) was presented to a Canadian group of quality experts, the ISO/CAC/TC 176, for verification purposes. This group, composed by 50 quality practitioners and researchers representing Canada in ISO meetings and resolutions, is considered to be a suitable forum, given their experience in the quality field and integration issues.

The verification was done through the application of a five-page questionnaire, attached in Appendix B-3. This questionnaire was designed using mostly a close-ended format, reserving open-ended questions to where none of the provided answer was correct. The survey objectives were:

1. Validate the elements included in the model are adequate to describe an IMS
2. Validate clarity in the model to present relationships
3. Gather input for improving perception.

To achieve this set of objectives, the questionnaire was divided in three sections. The first section contains five introductory questions to identify specific aspects of the respondent. The second section, consisting of eight questions, is aimed to know the level of knowledge of respondents on IMS issues. The last section addresses ten questions regarding to the IMS model designed in this investigation asking respondents for their qualitative insights on the IMS principles, elements and interactions. For further information see Appendix B-3

Eleven questionnaires were returned properly answered. Although not a high percentage, only 22 percent of the total, this sample is considered representative since people knowledgeable on integration issues is extremely limited. After analyzing the answered questionnaires, most of the results confirmed the assumptions made in the model about the elements already included as well as the relationships between such elements. Not surprisingly, the idea of using standardized MSs as building blocks for the IMS model is also shared by these experts who seen QMS, EMS and OHSMS as good alternatives to be part of an integrative model. Also, some ideas were provided to improve the overall representation of the system, specifically, to emphasis the role of stakeholders. For further detail in the survey, its analysis and results, the reader may refer to Appendix B-1.

3.5.3 Designing the IMS Implementation Methodology

Directly linked to the already designed IMS model, an IMS Implementation Methodology is developed from the QFD technique, defining the activities that, when followed, eventually would implement the IMS in an organization. Figure 3-3 displays an auxiliary methodology to develop such Implementation Methodology parting from the QFD utilized in designing the IMS model. First, two main aspects are defined, looking to find the necessary activities to implement each and every element of the IMS and a suitable configuration or structure that facilitates such process in any given organization.

To define which activities are necessary, the Third QFD House is developed from the IMS model elements found in the Second QFD House. To support this analysis, additional concepts and techniques are explored: PDCA cycle, to facilitate process organization at all levels; IMS principles, to guide each activity assuring consistency among them; and excellence principles and techniques, to facilitate integration and continuous improvement of overall IMS performance.

On the other hand, a suitable structure to deploy those activities is also required. Since flexibility of implementation is deemed one of IMS most essential characteristic, to develop the sequence of activities in a controlled yet flexible manner a number of concepts are consulted to provide a sound methodology. Therefore, the structure is developed by using the following: a modular configuration, to establish specific milestones and decision points an organization may use to define IMS own levels of performance and implementation pace; the iterative loop concept, to allow flexibility for finishing IMS scope and sequence of integration; the negative feedback loop concept, to provide a control mechanism in critical activities; and the learning curve concept, to emphasize learning as a key process for a better implementation and integration of management systems.

By applying this set of concepts and techniques a three-phased IMS implementation methodology is outlined, describing, in a series of guidelines, each phase and corresponding activities, including specific aspects such as purpose, resources, procedures, outputs and control elements. Further information is enclosed in Chapter Five

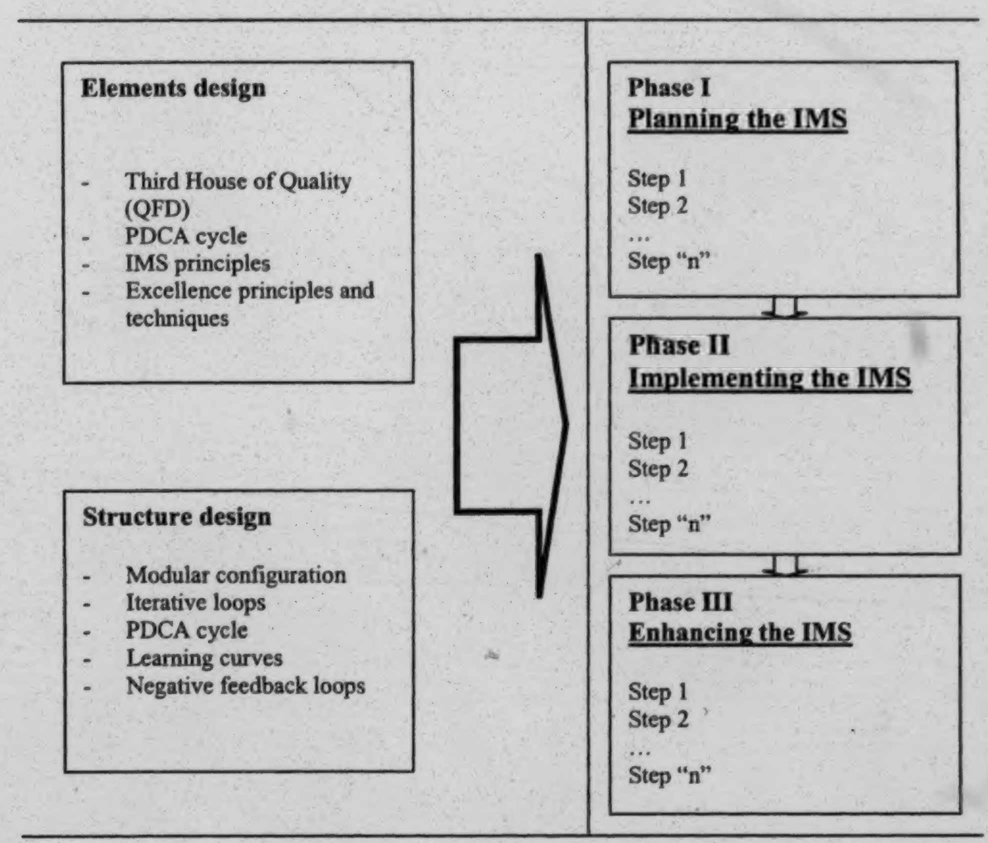

Elements design
- Third House of Quality (QFD)
- PDCA cycle
- IMS principles
- Excellence principles and techniques
Structure design
- Modular configuration
- Iterative loops
- PDCA cycle
- Learning curves
- Negative feedback loops
Phase I
Planning the IMS
Step 1
Step 2
...
Step "n"
Phase II
Implementing the IMS
Step 1
Step 2
...
Step "n"
Phase III
Enhancing the IMS
Step 1
Step 2
...
Step "n"

Figure 3-3: Aspects for Designing an IMS Methodology

3.5.4 Designing an Auditing Subsystem for an IMS

The same principles used to develop the IMS model are also the basis to develop an auxiliary methodology to analyze current alternatives for auditing practices and integrate them into the IMS model structure. This methodology creates an auditing management system (AMS) model as an integral constituent of the IMS model and subsequently, explores auditing roles and necessities as an assessment tool along the IMS implementation methodology.

3.5.4.1 Developing an AMS

In the methodology followed to develop auditing as part of the IMS model, two main considerations are addressed: first, auditing should be able to fully assess the IMS entire scope range, and second, auditing should be strongly linked to the IMS elements to be consistent with the integration approach of the entire research. A specific methodology is developed to ensure both considerations are included (See top section Figure 3-4) in Chapter Six when an auditing system is designed. First, all relevant international guidelines for auditing the selected four MS Standards are identified and their requirements are aligned and harmonized under the all-encompassing approach previously used in the IMS model. Next, auditing best practices requirements are identified, analyzed and included into the harmonized set of standardized auditing requirements creating the Auditing Proto-System. Then, these auditing requirements are contrasted with comparable IMS model requirements identifying gaps and differences in content. Finally, an auditing set of guidelines is drafted, harmonizing identified differences and gaps between auditing and IMS requirements using the all-encompassing approach.

3.5.4.2 Enhancing an AMS

As a dynamic element within the IMS model, auditing will be applied at different times and under different circumstances to assess an IMS implementation, thus requiring different and enhanced auditing roles and auditing procedures.

Applied in Chapter Seven, this methodology (See bottom section Figure 3-4) starts by challenging the common view of auditing as a compliance checking tool and visualizing four different roles or objectives auditing has as a supporting system within an IMS. The framework of reference for evolution of a management system, employed to justify the IMS model in Chapter Four, is also utilized to show the evolution of auditing into these four roles. Next, two assessment techniques, self-assessment and benchmarking, are analyzed to find out their assessment abilities to pursue those four auditing objectives. Then, requirements for both techniques are contrasted with comparable auditing requirements, as described at the end of Chapter Six, identifying gaps and differences of scope. Those differences are duly noted and modifications are included into the auditing requirements. Finally, it is described how the modified auditing management system, containing self-assessment and benchmarking assessment abilities, facilitates each phase of the IMS implementation methodology.

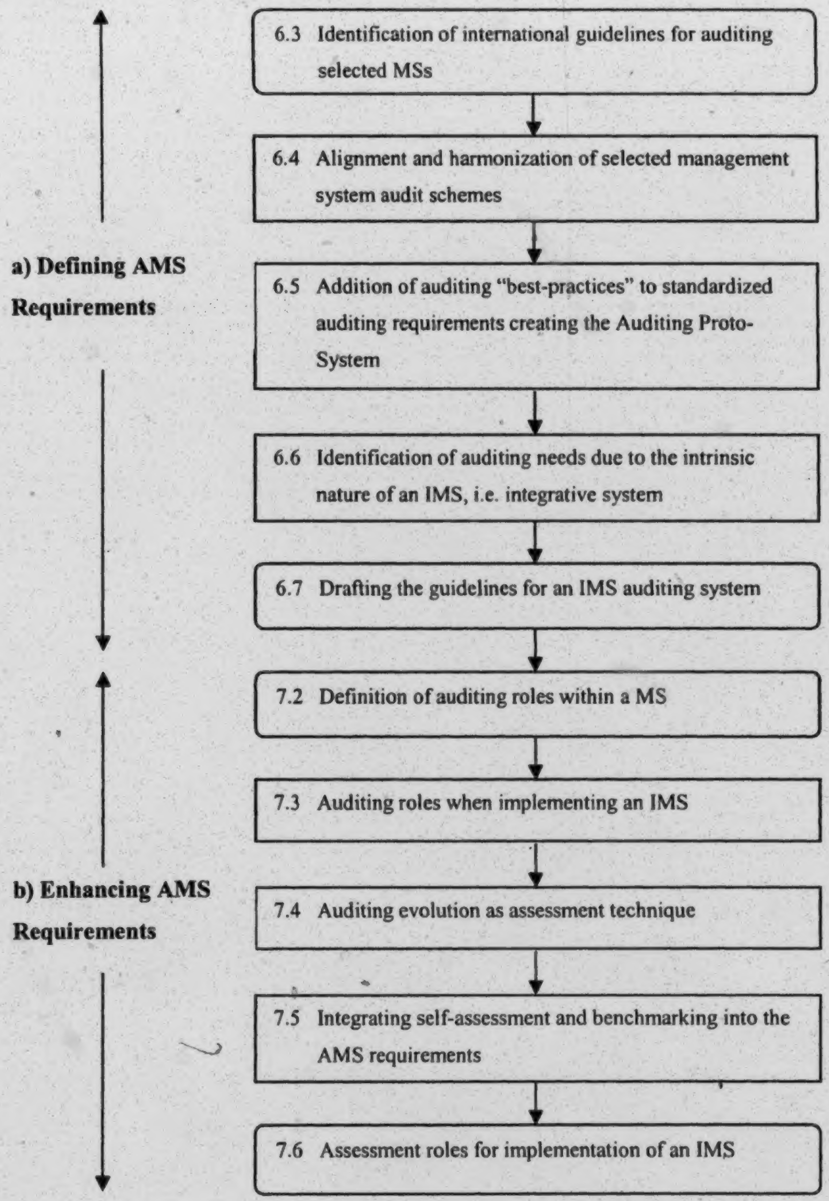

6.3 Identification of international guidelines for auditing selected MSs
6.4 Alignment and harmonization of selected management system audit schemes
a) Defining AMS Requirements
6.5 Addition of auditing "best-practices" to standardized auditing requirements creating the Auditing Proto-System
6.6 Identification of auditing needs due to the intrinsic nature of an IMS, i.e. integrative system
6.7 Drafting the guidelines for an IMS auditing system
7.2 Definition of auditing roles within a MS
7.3 Auditing roles when implementing an IMS
b) Enhancing AMS Requirements
7.4 Auditing evolution as assessment technique
7.5 Integrating self-assessment and benchmarking into the AMS requirements
7.6 Assessment roles for implementation of an IMS

Figure 3-4: Methodology for developing IMS auditing guidelines

3.6 Validating the IMS Conceptual Framework

This validating point is devoted to the overall IMS conceptual framework, which includes the Model and two sets of supporting guidelines, one for the implementation methodology and a second for the auditing system. The purpose of this validation is to test the following assumptions about the IMS conceptual framework:

a flexibility to address different starting points
b flexibility to incorporate different sequences of integration
c adaptability to be implemented in different organizational contexts
d adaptability to meet different stakeholders' requirements
e documentation changes required
f identification of methodological limitations

To do this validation, two simulations using real-life data from two Canadian companies are developed, creating two Company Cases (CCs). The methodology followed to create these two CCs is displayed in Fig 3-5, showing four stages:

1 CC and IMS scope definitions
2 Data Collection
3 Data Compilation
4 Gap analysis

3.6.1. CC & IMS Scope Definitions

Finding a suitable organization to gather the data from and defining the scope of integration are the first decisions to make. In selecting the companies two conditions are involved:

a) Existence of at least one standardized Management System: Since the IMS includes four particular standardized MSs, it is required for the potential case company to have at least one of them already implemented.

b) Easy access to the information. It is necessary to have information pertaining to the business strategies and overall management systems in addition of the implemented MS to simulate the implementation of an IMS in such conditions.

The first selected company, CCA, has already an ISO 9001:2000 registered QMS while the second company, CCB, is an ISO 14001:1996 registered with three years of experience. They present two different organizational and market contexts with different stakeholders' requirements that an IMS is intended to meet. Further information on each CC background is provided in Chapter Seven and Eight.

On the other hand, the IMS scope is defined from the combination of the current MSs implemented in these companies. Therefore, an IMS integrating quality and environmental is selected as the final point for the simulated IMS, looking to validate the IMS conceptual framework flexibility to address different starting points and sequences of integration.

3.6.2 Data Collection

From each CC, information is collected, mostly from document review, observation, process tracking, secondary data (a previous research done by a master student from the University of Alberta) and as an observer, following the rules set in ISO 19011 for this type of auditing participant, during the performance of system-wide audits in both CCs.

This information is gathered with the guidance of checklists made directly from the IMS set of requirements. Each of the seven IMS model elements is then analyzed to see how it has been implemented and differences are identified. Also, the methodology followed by each CC in implementing and maintaining its MS registration is included as part of the data collection. When particular information was not found, a request was made to the CC representative in order to either provide it or validate its non-existence.

3.6.3 Data Compilation

The collected information is compiled using the IMS model outline as a blueprint, thus allowing identifying gaps between each CC management elements and the IMS model requirements. This collection and compilation of information is by all means similar to the "initial review" activity as described in the IMS implementation methodology. From this point forward each CC is developed and presented following the sequence of activities described in the IMS implementation methodology, starting with the gap identification.

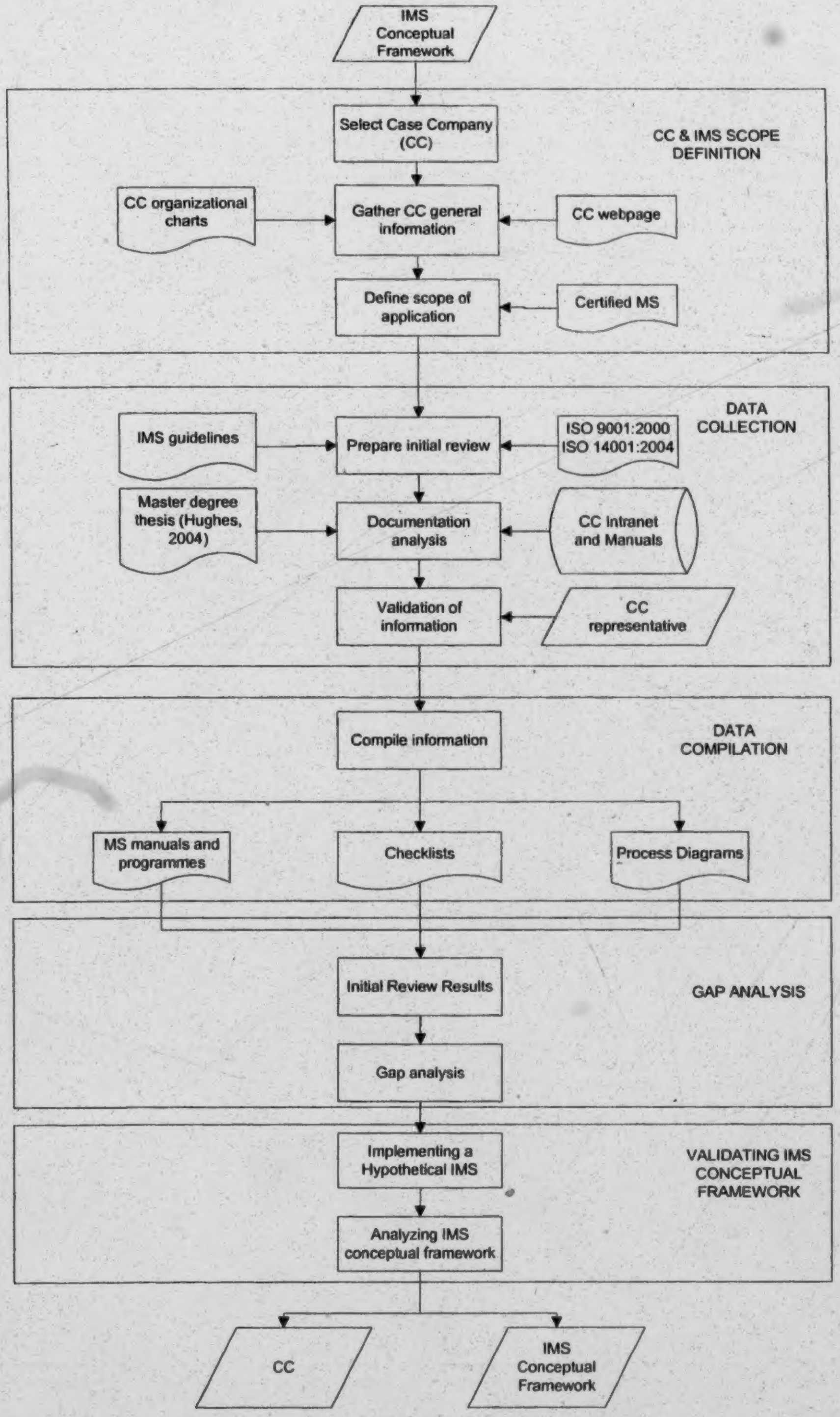

IMS Conceptual Framework
CC & IMS SCOPE DEFINITION
Select Case Company (CC)
CC organizational charts
Gather CC general information
CC webpage
Define scope of application
Certified MS
DATA COLLECTION
IMS guidelines
Prepare initial review
ISO 9001:2000 ISO 14001:2004
Master degree thesis (Hughes, 2004)
Documentation analysis
CC Intranet and Manuals
Validation of information
CC representative
DATA COMPILATION
Compile information
MS manuals and programmes
Checklists
Process Diagrams
GAP ANALYSIS
Initial Review Results
Gap analysis
VALIDATING IMS CONCEPTUAL FRAMEWORK
Implementing a Hypothetical IMS
Analyzing IMS conceptual framework
CC
IMS Conceptual Framework

Figure 3-5: Company Cases Development

3.6.4 Gap Analysis

Each CC presents different initial conditions in their pursuit of an IMS as defined from this initial review and data compilation. Each element of the IMS is analyzed and evaluated and particular gaps in content were identified. A plan to fill out such gaps is developed as the first phase of the IMS implementing methodology output.

3.6.5 Simulating an IMS Implementation

A hypothetical IMS is erected from the results of the gap analysis, following the entire second phase of the implementing roadmap. Two cycles are performed, with the first one dedicated to enhance the currently implemented MS, followed by the second, where the additional MS is integrated, creating in the end the IMS. Although the methodology may be going further to enhance the S-IMS, for purposes of illustration each CC will be developed to reach only this stage. Each step of the methodology is explained, first describing the current managerial infrastructure found in the initial review, followed by a depiction of the necessary modifications and additions to be made as well as suggested methods and procedures to be applied.

3.6.6 Analyzing the IMS Conceptual Framework

From these two hypothetical IMSs built upon these CCs, the assumptions mentioned in Section 3.6 are analyzed and discussed looking to test IMS conceptual framework value as an integrating tool. Limitations are then identified and, when required, modifications are incorporated to specific elements of the IMS conceptual framework.

3.7 Summary

This chapter describes the methodology guiding the entire research. First, it presents the overall research methodology to develop and validate a conceptual framework for integration of standardized management systems. Each methodology phase is then broken down into auxiliary methodologies, described through flowcharts and linked to corresponding Chapters.

4 An IMS Model

4.1 Introduction

The present chapter presents the conceptualization of a model for the integration of four different standardized management systems: Quality, Environmental, Occupational Health and Safety and Corporate Social Responsibility. This model is based on a generic framework to include, in a consistent and integrative manner, all the management elements and corresponding requirements described in the original MSSs. To develop the IMS model as main component of the IMS conceptual framework, the research methodology described in Section 3-4 is followed.

4.2 Defining the IMS Concept

To define an IMS is necessary to define first a context for comparison, which will allow us to distinguish such IMS from a random combination or possibly an aligned permutation between distinct management systems. A three-dimension grid is visualized, where any organization's management structure can be represented showing the number of management systems implemented, their level of maturity and completeness and their level of integration between them. This grid is built upon three dimensions: "augmentation", "ascension", and "assimilation" (Rocha and Karapetrovic, 2005).

1. "Augmentation" means building over a foundation and, in the context of MSs, this happens when to an MS compliant with a standard, the system is expanded to include additional processes. For example, complaints-related processes modeled after the customer satisfaction complaint system standards (ISO 10001: 2006 for codes of conduct, ISO 10002: 2004 for internal complaints handling and ISO 10003: 2006 for external dispute resolution) can be integrated into the main quality MS (QMS) mirroring the ISO 9001: 2000 MSS (e.g. see Dee et al., 2004).
2. "Ascension" means expanding someone's performance abilities to get better results. Applied to the context of MSs, it happens when a management system satisfies the requirements of its stakeholders increasingly better, going from none to excellence and delight. For instance, a QMS can start at a level of an informal program geared towards a specific product line, then being improved or "ascended" first to satisfy internationally recognized minimum requirements with

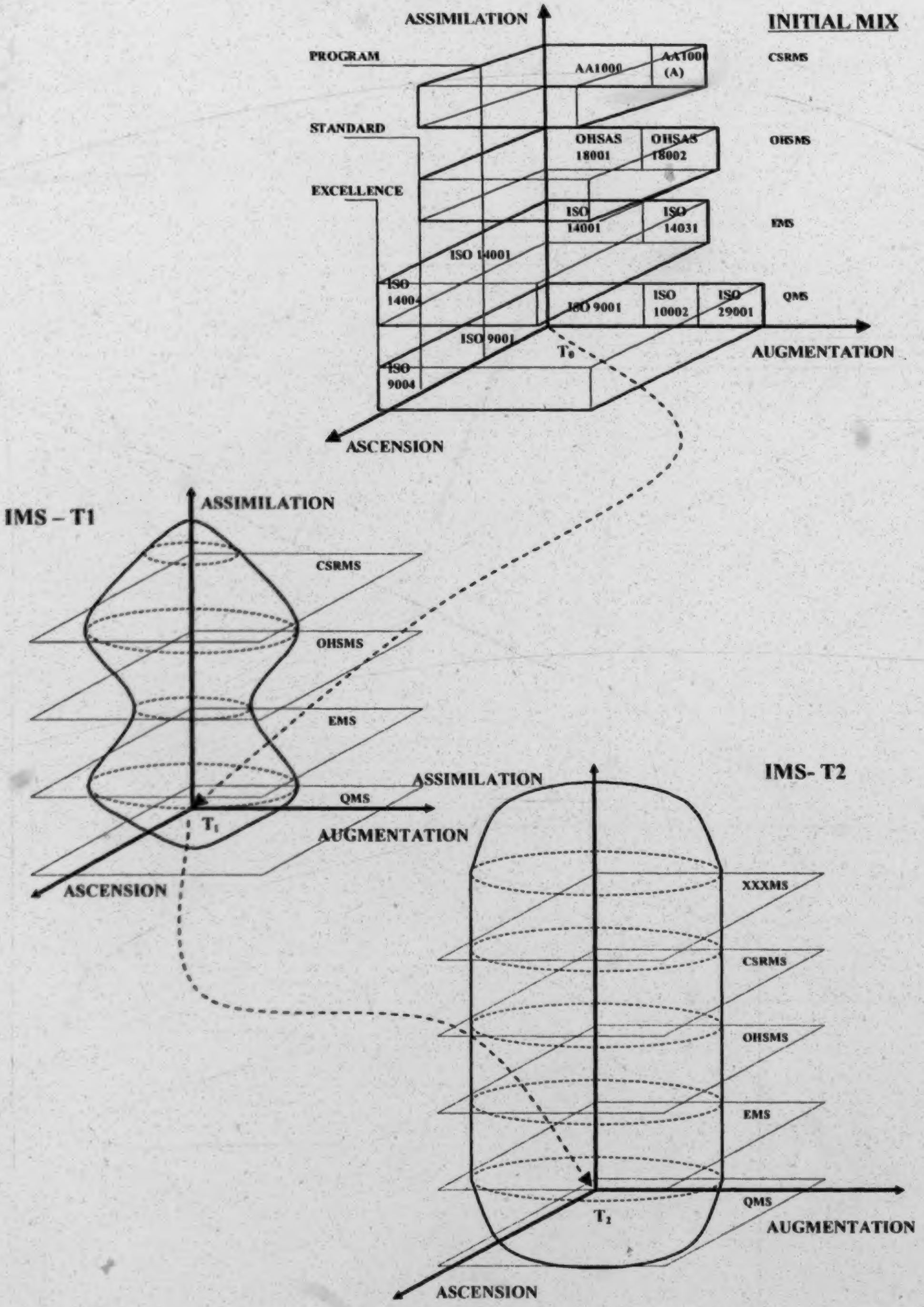

INITIAL MIX
ASSIMILATION
PROGRAM
STANDARD
EXCELLENCE
AA1000
AA1000 (A)
CSRMS
OHSAS 18001
OHSAS 18002
OHSMS
ISO 14001
ISO 14031
EMS
ISO 14001
ISO 14004
ISO 9001
ISO 10002
ISO 29001
QMS
ISO 9001
ISO 9004
T_0
AUGMENTATION
ASCENSION
IMS – T1
ASSIMILATION
CSRMS
OHSMS
EMS
QMS
T_1
AUGMENTATION
ASCENSION
IMS- T2
ASSIMILATION
XXXMS
CSRMS
OHSMS
EMS
QMS
T_2
AUGMENTATION
ASCENSION

Figure 4-1: From the Initial Mix to IMS

ISO 9001: 2000 and or ISO 14001: 2004 registration and later possibly towards excellence with the addition of ISO 9004: 2000 (e.g. see Boys et al., 2004). As opposed to the augmentation-type MSS, however, which cover only one specific element of a MS, the ascension-type MSS relate to the whole MS

3. "Assimilation" means absorbing or integrating an isolated component into a system. This dimension of management system considers the interdependency of the existing management systems in an organization. This is of utter importance for this research since its objectives is the creation of such IMS where particular management systems are assimilated and essentially becoming subsystems of the IMS (e.g. see Karapetrovic and Jonker, 2003).

Using these three dimensions, represented as spatial dimensions for better illustration, and adding "time" as an extra dimension, the progression for implementing an "n" number of management systems that ends up with a truly IMS can be visualized. This sequence, shown in Figure 4-1 is most helpful to understand and define what an IMS represents.

The concept of an IMS refers to a unique set of assimilated, interdependent and function-specific subsystems, each established in accordance with one or more MSS, which share a collective pool of human, material, information, infrastructure and financial resources to achieve both the overall and function-specific goals (Beckmerhagen et al., 2003). On the other hand, traditional MSs are developed independently and largely at different times, namely when the corresponding standards become available or crucial for the company's operation (Karapetrovic and Jonker, 2003). This difference is easily perceived in Figure 4-1, where from an initial combination of MSs an IMS is created.

At initial time (T_0), the organization shows a number of MSs that can be represented by parallel plains, barely connected among each other. Figure 3-2 (upper right side) illustrates those plains, featuring a number of different MSs and their corresponding standards. This implementation, of disassociative nature, is very common in practice and unfortunately very problematic (e.g., see Karapetrovic and Jonker (2003) for an elaboration). At T_1, the organization has a quasi-IMS, where core elements have been integrated yet each management system maintains their identity through their exclusive elements, represented by an uneven curve crossing the plains (left side of Figure 3-2). At the end, in T_2 a truly IMS is created by plugging the subsystems into an integrative framework, albeit the different times of implementation, dictated by MSS availability or necessity (depicted in lower right side of Figure 3-2). This final system, interdependent in all three dimensions, fits with the notion of an IMS defined by Beckmerhagen et al (2003) mentioned before.

4.3 Defining the IMS Scope

Defining the scope of the IMS model will established the boundaries of the system (See literature survey section 2.5.1 and 2.5.2) as well as its potential value for an organization. The value of the resulting IMS will depend, among other things, on how well its scope is aligned and linked to the organization's general objectives. The stakeholders' theory, especially the operative definition by Foley (2004), also calls for such alignment and integration. Therefore, understanding of the relationship between functional MSs and the organization's general vision and mission is essential to define accordingly a valuable scope for a soon-to-be designed- IMS.

Generally speaking, an organization tries to maximize the value offered to stakeholders (maximize benefits) within the restrictions set mostly by availability of resources and existing legislations, i.e. level of feasibility. The relationship between objectives and restrictions between MSs can be represented, merely for purposes of illustration, using a set of equations where "n" is the total number of stakeholders targeted by "m" number of MSs that uses a certain combination of a total of "r" resources.

1. **Objective Function of an organization:**

$$Max(C^T(Stakeholder_1)(Satisfaction\_Level_1)x(Stakeholder_2)(Satisfaction\_Level_2)x$$
$$\ldots .x(Stakeholder_n)(Satisfaction\_Level_n))$$

An organization's integral objective can be roughly represented for a multiplication function where all stakeholders are considered (from "1" to "n"), each addressing their specific relative importance to the organization (represented by a matrix C^T) and the level of satisfaction achieved (from stakeholder 1 to "n") in a specific period of time. The total value obtained depends on a multiplicative basis result rather than a mere addition. Although this representation is rather simplistic, this interrelation between stakeholders and their levels of satisfaction would bring the organization's growth in the long term. Failing to consider this holistic approach may bring low levels of total value. For instance, missing or completely lacking to satisfy one stakeholder, which by definition has a certain level of power over the organization, may convey serious consequences to the organization, e.g. failing to satisfy environmental regulations will cause being fined or, in the worst scenario, a shut down of the company.

2. **Restricted to**

$$A\_(Stakeholde\ r_n) = B\_(Management\ \_\ System\ _m)$$

All stakeholders provide to the organization with specific resources and support, which in turn, are deployed through the blend of management systems existing within an organization. In this equation, the restriction is stated in function of resources, or rather, their translation between stakeholders (left side of the equation) and the users, i.e. management systems (right side). A unique pool of resources, represented by matrix *"B"*, is provided by stakeholders, represented by matrix "A", to be shared and used by those management systems. A better integration between MSs would help to deal with resources: a better procurement of resources from stakeholders and a better use by a potential IMS.

Understanding this relationship between MSs and stakeholders will help to define the boundaries of the IMS model. Although the relevance of a management system is unique per each organization, depending on factors such as type of market, size of organization and levels of public confidence, a general set of criteria must be defined to select a number of them to define the scope of this initial IMS model. Section 2.8 of the literature defines such criteria, used in Table 2-3 to select four standardized MSs: QMS, represented by ISO 9001:2000; EMS, represented by ISO 14001:2004; OHSMS, described by OHSAS 18001:2002 and CSRMS, described by AA1000.

4.4 Analyzing Selected Stakeholders

Once four standardized MSs have been selected to be ingredient of the integration process, the range of stakeholders targeted by the IMS can also be defined. However, the role of stakeholders needs further elaboration to do so.

It is a fact that stakeholders are almost never entirely satisfied by a single MS. Even when a management system is entirely dedicated to satisfy a single stakeholder, some of its requirements would be outside of the MS scope. If an organization wants to meet such needs, another system should be implemented. For example, employees' health and safety are covered by OHSMS, leaving out issues that are also important for employees such as fair wages, labour rights and environment. An organization should use other means to cover such requirements and using an MS, i.e. a CSRMS, is a possible alternative. Also, stakeholders have dual roles when engaged with an organization. Following the restriction equation addressed in section 4.3, each stakeholder participates on every one of the MSs under different roles: as providers of information, especially when they are MS main target; as organizers of MS activities; as doers, carrying forward with MS operation; or solely as supporters, bringing resources into the system. Understanding both considerations: the dual role of stakeholders in the IMS, and the fact that stakeholders may be satisfied by one or more MSs will help us to know and track potential benefits from the IMS as well as to be aware of potential conflicts among stakeholders' interaction.

Table 4-1 illustrates how the selected stakeholders interact with and within an organization, first as providers and later as receivers of the MSs outputs. At the right side it is shown specifically how each stakeholder provides for each MSs in roles such as organizers (O), doers (D), supporter (S) or information provider (I). The cycle is closed when each MS delivers to each stakeholder outcomes according to their level of priority for such MS: primary targets (P) when the MS consider it as the main client, complementary targets (T) when a stakeholder is satisfied indirectly by the MS, or bounding stakeholders (B) when a stakeholder sets maximum or minimum levels for the MS in question. For example, customers provide with information for the QMS (as the system primary stakeholder), support for the EMS (customers tend to be more environmental conscious), and information for the CSRMS (customers are also part of society). Table 4-1 also shows that, in return, customers receive products of quality (QMS), produced with a reasonable use of natural resources (EMS) and through a safe and healthy environment for employees (OHSMS), meeting as well social and ethical values at large (CSRMS). This interaction of stakeholders, and more exactly the feedback cycle, could only exist when the organization is aware of it and top management leads the way. This is a main reason for integration of systems.

IMPACT OF EACH STAKEHOLDER'S AS PROVIDERS								MS OBJECTIVES	MSs OUTCOMES FOR EACH STAKEHOLDER							
Customer	Supplier	Employee	Stakeholder	Environment	Government	Labor Union	Society		Customer	Supplier	Employee	Shareholder	Environment	Government	Labor Union	Society
								QMS								
I	D	O&D	S	S	S	S	I	Ability to provide product that meets customer requirements	P	C	C	C	B	C	C	B
I	D	O&D	S	S	S	S	I	Ability to provide product that meets applicable regulatory requirements	P	C	C	C	B	P	C	B
I	D	O&D	S	S	S	S	I	Working in a continuous basis	P	C	C	C	B	C	C	B
I	D	O&D	S	S	S	S	I	Achieve customer satisfaction	P	C	C	C	B	C	C	B
								EMS								
S	S	O&D		I	S	S	I & S	Support environmental protection in balance with socio-economic needs	B	B	C	B	P	C	C	C
S	S	O&D		I	S	S	I & S	Commitment to comply with applicable environmental legal requirements	B	B	C	B	P	P	C	C
S	S	O&D		I	S	S	I & S	Support prevention of pollution in balance with socio-economic needs	B	B	C	B	P	C	C	C
								OHSMS								
	I	O&D&I			S	I	S	Eliminate or minimize risk to employees to OH&S risks associated with its activities in the workplace	B	C	P	B	C	C	P	C
	I	O&D&I			S	I	S	Eliminate or minimize risk to stakeholders to OH&S risks associated with its activities in the workplace	B	C	P	B	C	C	P	C
	I	O&D&I			S	I	S	Demonstrate conformance with OH&S policy to stakeholders	B	C	P	B	C	C	P	C
	I	O&D&I			S	I	S	Commitment to a least comply with current applicable OH&S legislation	B	C	P	B	C	P	P	C
								CSRMS								
I	I	O&D&I	I	I	I & S	I	I	Commit to the Process of Social and ethical accounting, auditing and reporting	C	P	C	C	C	C	C	P
I	I	O&D&I	I	I	I & S	I	I	Engage stakeholders within this process	C	P	C	C	C	C	C	P
I	I	O&D&I	I	I	I & S	I	I	Identify stakeholders and their issues to be met by organization's performance	C	P	C	C	C	C	C	P

Simbology
(O) ORGANIZER
(D) DOER
(S) SUPPORTER
(I) INFORMATION PROVIDER

Simbology
(P) PRIMARY TARGET
(T) COMPLEMENTARY TARGET
(B) BOUNDING TARGET

Table 4-1: Interaction of stakeholders in an IMS

As a consequence, these interactions between stakeholders should be included in the IMS model, making necessary to have a conceptual methodology to do so. From the field of quality, a technique employed to design quality into products according to customer requirements was selected to provide guidance in the IMS design: the Quality Function Deployment (QFD).

4.5 Tailoring a Conceptual Design Technique

Quality Function Deployment (QFD) is a highly-regarded quality tool utilized to design specific product(s), along with their quality production system, aligned to customer requirements. Presented by Yoji Akao in 1966, QFD is, in his own words, "a method for developing a design quality aimed at satisfying the consumer and then translating the consumers' demands into design targets and major quality assurance points to be used throughout the production stage" (Akao, 1990). This technique helps to design a quality system for a specific product, either good or service, to satisfy particular and recognized customer requirements. Traditionally, QFD develops four matrices or Houses of Quality

(HoQ) in sequential mode, thus providing with a systematic transition for translating customer requirements into the product and production processes. This scheme can be, also modified if higher levels of detail and complexity are required (Akao, 1996; Abd et al., 2003). Improved quality design, reduction on lead times for new and modified designs, strong links among design and production, and a motivating work environment for people are some of the expected benefits from using QFD (Sullivan, 1986; Herzwurm and Schockert, 2003).

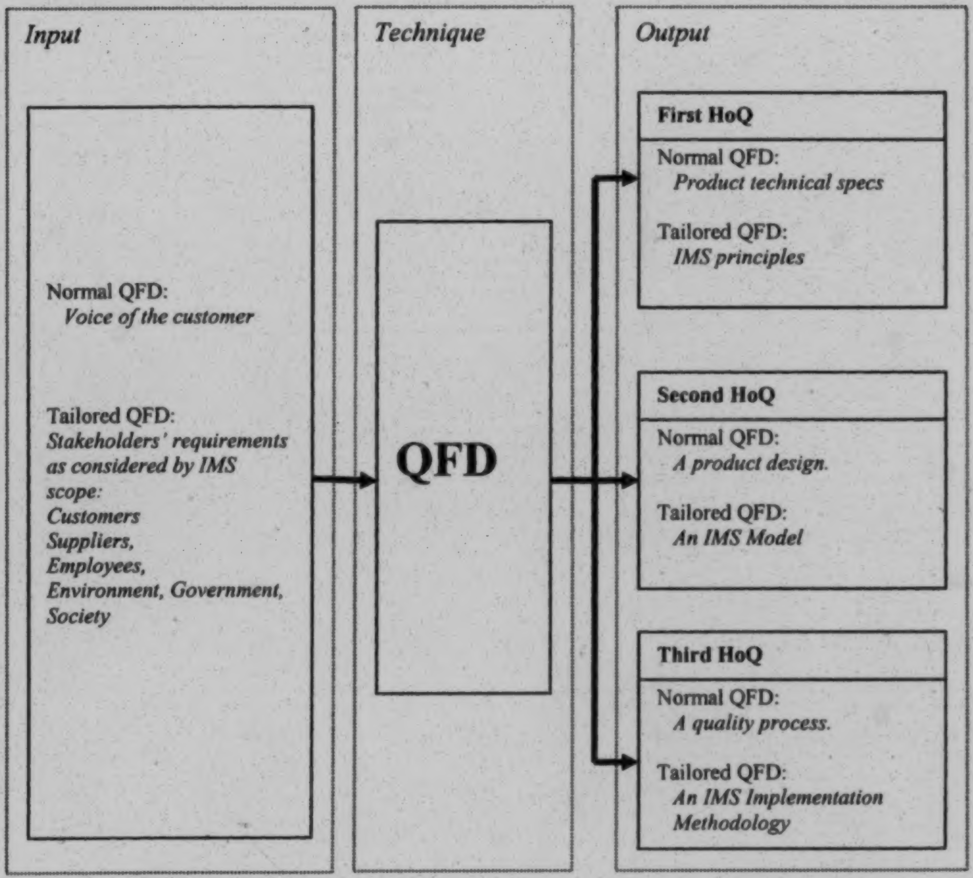

Input
Normal QFD:
Voice of the customer
Tailored QFD:
Stakeholders' requirements as considered by IMS scope:
Customers
Suppliers,
Employees,
Environment, Government,
Society
Technique
QFD
Output
First HoQ
Normal QFD:
Product technical specs
Tailored QFD:
IMS principles
Second HoQ
Normal QFD:
A product design.
Tailored QFD:
An IMS Model
Third HoQ
Normal QFD:
A quality process.
Tailored QFD:
An IMS Implementation Methodology

Figure 4-2: A Four-House Quality sequence towards an IMS

Considering that, at least, a model and a methodology for implementing it are required to integrate MSs, QFD is selected to provide the necessary guidance to create a robust IMS model (the product) and a flexible implementation roadmap (the process) tightly aligned to the range of stakeholders' requirements. QFD does so by finding common ground among selected stakeholders' requirements, as mentioned in section 2.4, and assuring that both model and methodology are consistent with such requirements. However, some modifications to the QFD procedure are yet necessary in order to include a broader range of stakeholders and change the approach, from a tangible product to a 'soft' one like is a management system model. For instance, this application will only need to develop three Houses of Quality (see Figure 4-2). The first two Houses of Quality (HoQ) are used in this chapter to create the IMS model while the third HoQ is used in the next chapter where the roadmap for implementing the IMS is developed.

4.6 Designing the IMS

4.6.1 Finding the IMS principles

Normally, for the first QFD chart, customers must be defined and their requirements gathered, as stated by them, to create what is called "Voice of the Customer". For the IMS design, this "Voice of the Customer" will become into the "Voice of the Stakeholder" comprising then:

1. Customers, employees and suppliers as they are considered by the QMS;
2. Environment, community and government as considered by the EMS;
3. Employees (people in general at the workplace), labour union and government as mentioned by the OHSMS; and
4. Community, employees, and society in general as addressed by the CSRMS.

Also, the organization itself should be considered as another stakeholder. Some of the required features of the IMS model, like being applicable to any organization and possessing clear and strong links to the overall business management cannot be assigned to a specific stakeholder but are essential to the organization as a whole. Therefore, for integration purposes, the organization is also viewed as another stakeholder.

All these stakeholders are then listed, each describing specific requirements as established in each seeding MS standard. These requirements, presented in full detail as Appendix A-1, are broad in range indeed, spanning from general issues, e.g. continual improvement in satisfying any stakeholder to those of very specific nature, e.g. compliance with legal and ethical practices in child labour. This comprehensive list is considered the "Voice of the Stakeholder". Table 4-2 presents an extract of the list, showing requirements that are applicable to any stakeholder and addressed by all the considered MSSs. For instance, a general applicability to any organization is a highly appreciated feature of the product, i.e. the IMS must be applicable to any company, regardless type, size, sector or geographical situation.

Translating the "Voice of the Stakeholder", the first HoQ produces a set of specifications for the product. Given the unusual nature of the current application, i.e. a MS model, these specifications for the IMS are also administrative in character, resulting into a set of core principles that will guide the IMS design. To recognize them, several sources are consulted: A set of five 'key integration questions' written by Beckmerhagen et al. (2003), arguments in favour or against an IMS (Wilkinson and Dale, 1999), missing elements not considered in earlier proposals (Wilkinson and Dale, 2001), possible strategies for integration (Karapetrovic, 2002) and the need for a recipe and ingredients (Karapetrovic and Jonker, 2003) are incorporated into the analysis.

Standard/Clause	Issues Explicitly Addressed in the Standard
All Stakeholder-related	
AA1000 P1.6	Formal inclusion of representatives of stakeholders in managing processes
AA1000 Introduction; AS 3028 Clause 1.1	Applicable to any organization
AA1000 P8.6; AS 3028 Clause 2.5	Continuous improvement of processes and performance
AA1000 P1	Inclusion of stakeholders in the whole process
AA1000 P3.3	Make available its current mission and values to stakeholders
AA1000 P4.3	Comply with fair and ethical trade
AA1000 P4.3	Manage human resources in a fairly manner
AA1000 P5.2	Communicate when particular stakeholders are excluded or included into future plans
AA1000 P5.6	Report stakeholder comments on the organizational selection of issues
AA1000 P3.3	Be open and accountable to stakeholders
ISO 14001 Clause 1	Applicable to any organization
ISO 14001 Clause 4.1	Continuous improvement of processes and performance
OHSAS 18001 Clause 1; ILO-OSH Clause 3	Applicable to any organization
OHSAS 18001 Clause 5.6; ILO-OSH Clause 3.16	Continuous improvement of processes and performance
OHSAS 18001 Clause 4.2; ILO-OSH Clause 3.1.2.a, 3.10.5.1	Eliminate or minimize safety risks to employees, temporary workers, contractor personnel, visitors and any other person in the workplace
ISO 9001 Clause 1.2	Applicable to any organization
ISO 9001 Clause 8.5	Continuous improvement of processes and performance

Table 4-2: Defining the Stakeholder requirements

Origin	IMS Specification - Principle
Stakeholders-driven	Stakeholders' focus
	Demonstration of ability to continuously satisfy stakeholder needs
	Accountability and open organization
	Compliance with legal regulation
	Social and ethical value decision-making
	Partnership development
	Awareness and training on other parties requirements
Organizational-driven	Leadership
	Factual decision-making
	Feasibility for integrating more standardized MSs
	Holistic management of resources
	Continual learning and improvement
	Integrated to overall business management
	Process approach-based
	Measuring of performance
	Flexibility in implementation and operation

Table 4-3: The IMS principles

Two categories of principles are established: stakeholders-driven and organizational-driven, with the former containing issues like stakeholder focus and accountability and open communication while the latter includes issues like leadership and process approach. A list of the resulting IMS principles can be found in Table 4-3 with a full explanation for each of them in Appendix A-2. These principles will be applied to the two remaining HoQ, thus facilitating the deployment of stakeholders' needs.

4.6.2 Defining the IMS model elements

The second HoQ is generated by incorporating the set of IMS principles, found in the first chart, obtaining a list of product's components, in this case, the elements of the IMS framework. To do so, the IMS principles are placed in the left side of the matrix and the resulting main IMS elements at the upper row. The resulting elements for the IMS model identified in this process are:

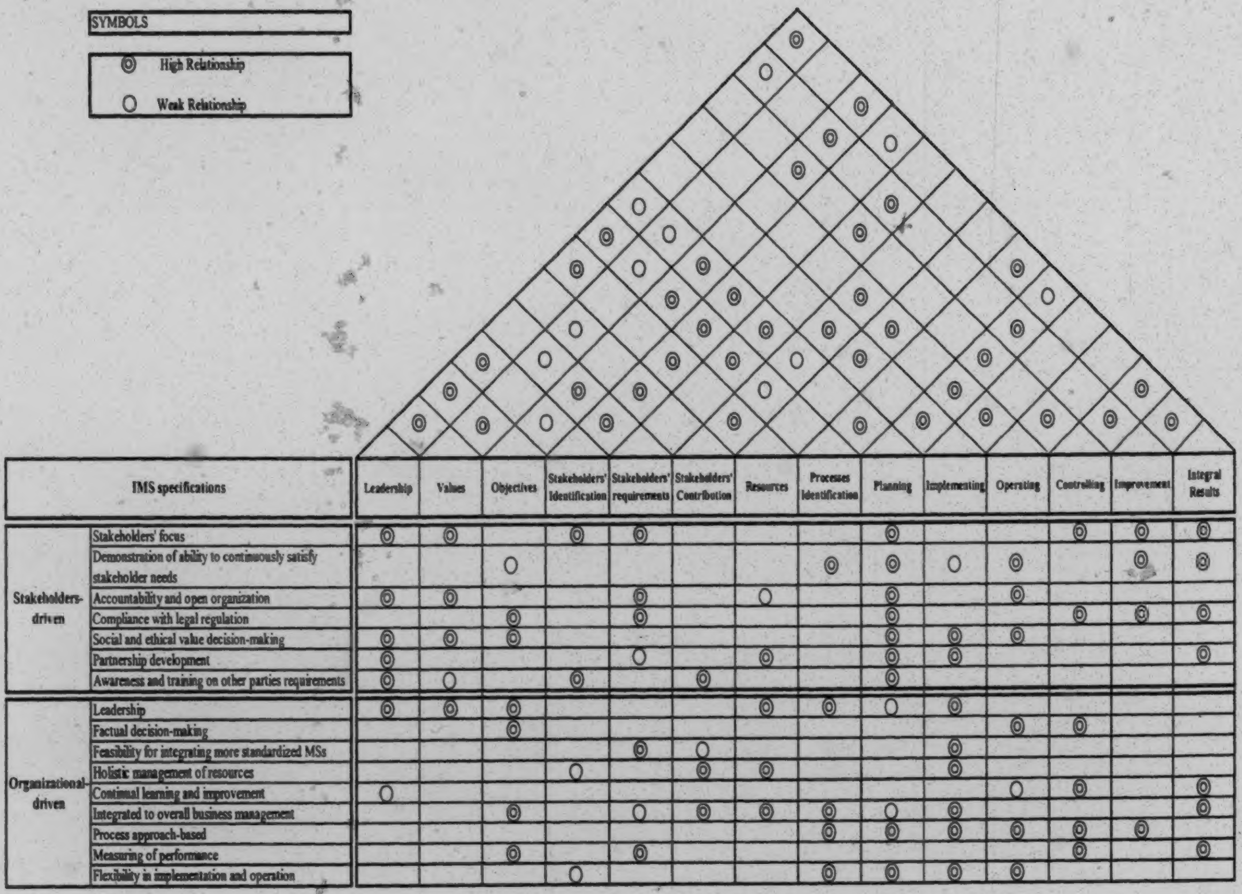
1. Leadership;
2. Organizational Values and Objectives;
3. Stakeholders, represented by their Requirements and their Provision;
4. Resources;
5. Processes, deployed into their components: Planning, Implementation and Operation, and Control and Improvement; and finally
6. Results.

The HoQ is then completed by grading the strength of the resulting interrelations between principles and elements (See Figure 4-3). For instance, "Partnership development" is deployed through "Leadership" (*strongly*), "Organization's values and objectives" (*weakly*), "Stakeholders' requirement" (*weakly*), "Resources" (*strongly*), "Processes planning" (*strongly*); "Implementing" (*strongly*) and as "Result" (*strongly)*. This way, QFD confirms that "partnership development" is indeed being included into the IMS model. The same line of thought is followed with the remaining principles.

Identifying the elements is an important step in designing the IMS model. However, as mentioned in the literature survey (Section 2.6.5) and motivation (Section 2.9), building an IMS involves defining the levels of integration within those elements. In a MS, two main parts can be identified, namely, its context, i.e. the structure or the underlying MS model) and its content, i.e. the substance or the MS requirements covered (Rocha and Karapetrovic, 2005). Integration between MSs should deal with both parts since both of them differ from one MSS to another (Karapetrovic and Jonker, 2003). Regarding the context, for example, QMS standards are based on the so-called process model, while EMS and OHSMS standards follow the "PDCA" approach. On the other hand, regarding the content, each MS Standard may contain varying requirements for a similar MS element, e.g. internal audit is stringer in AA1000 than in OHSAS 18001. This creates MSs to have different levels of augmentation and ascension as mentioned in Section 3.2 (Rocha and Karapetrovic, 2005).

4.6.3 IMS: The "Motor" Model

The elements found in the second HoQ are arranged to create an IMS model with a specific configuration that facilitates to visualize the interrelations among them. As a consequence, this model is called the IMS "Motor" Model for two reasons: first, to imply and encourage dynamism and motion as feature of the model; second, to explain the relations between targeted stakeholders and the different elements of an IMS. This particular configuration was, in fact, defined after two drafts and after the validation obtained from a Canadian group of quality experts, the ISO/CAC/TC 176, described in Section 4.9). Those initial IMS models are included as Appendix B-1.



IMS specifications		Leadership	Values	Objectives	Stakeholders' Identification	Stakeholders' requirements	Stakeholders' Contribution	Resources	Processes Identification	Planning	Implementing	Operating	Controlling	Improvement	Integral Results
Stakeholders-driven	Stakeholders' focus	◎	◎		◎	◎				◎			◎	◎	◎
	Demonstration of ability to continuously satisfy stakeholder needs			○					◎	◎	○	◎		◎	◎
	Accountability and open organization	◎	◎			◎		○		◎		◎			
	Compliance with legal regulation			◎		◎				◎			◎	◎	◎
	Social and ethical value decision-making	◎	◎	◎						◎	◎	◎			
	Partnership development	◎				○		◎		◎	◎				◎
	Awareness and training on other parties requirements	◎	○		◎		◎			◎					
Organizational-driven	Leadership	◎	◎	◎				◎	◎	○	◎				
	Factual decision-making			◎								◎	◎		
	Feasibility for integrating more standardized MSs					◎	○				◎				
	Holistic management of resources				○		◎	◎			◎				
	Continual learning and improvement	○										○	◎		◎
	Integrated to overall business management			◎		○	◎	◎	◎	○	◎				◎
	Process approach-based								◎	◎	◎	◎	◎	◎	
	Measuring of performance			◎		◎							◎		◎
	Flexibility in implementation and operation				○				◎	◎	◎	◎			

Figure 4-3: The second HoQ – Defining the IMS model

The IMS “motor” model, depicted in Figure 4-4, is conceptualized as a set of *planning, implementation and operation,* as well as *control and improvement* **processes** (“rotor”), which are propelled by **leadership,** and **values and objectives** (“stator”), transforming **resources** (“electrical energy”) *provided* by **stakeholders** (“supply unit”), into **results** (“rotational energy”), that will meet stakeholders’ requirements. Therefore, the model basically fosters the systems approach to integration, and can be adapted to include both the underlying approaches (e.g. “process” and “PDCA”) and the detailed requirements (e.g. shared and specific) of the current standards. A more detailed description of each element can be found in Appendix A-3.

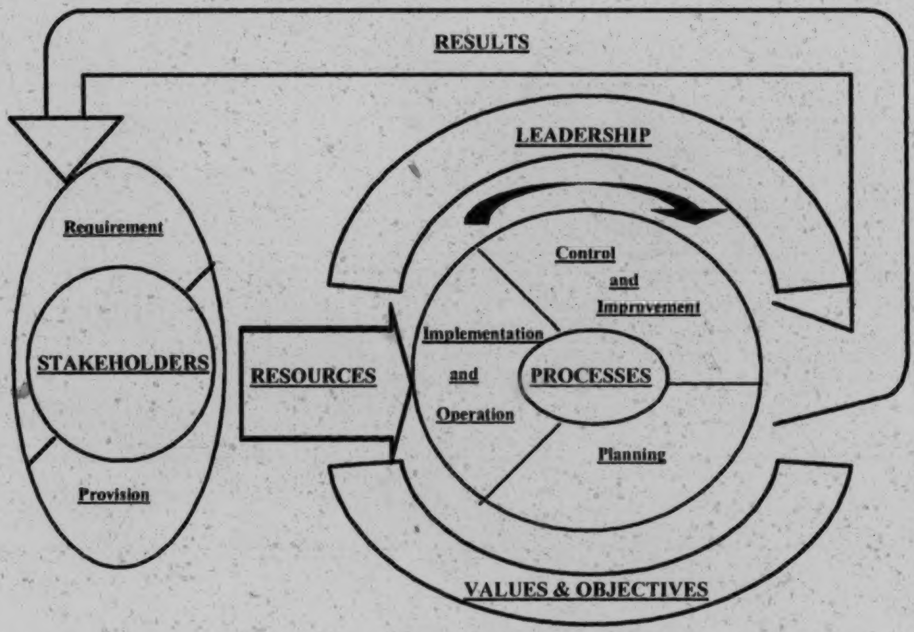

RESULTS
LEADERSHIP
Requirement
Control
and
Improvement
Implementation
and
Operation
STAKEHOLDERS
RESOURCES
PROCESSES
Planning
Provision
VALUES & OBJECTIVES

Figure 4-4: The IMS “Motor” model

As mentioned in the literature survey (Section 2.9), none of the current IMS models defines how their elements will embodied the requirements set in particular MSs and integrate them. To address this lack of detail, the designed IMS model is populated with requirements from the four standardized MSs using two integrative approaches. The first approach has the objective to harmonize the underlying models of the standards, i.e. PDCA cycle and process approach. To that end, a blended approach was developed using a helix-like structure where all processes are broken down in interrelated PDCA cycles. The second approach is utilized to provide an all-encompassing extent for similar requirements. This two-pronged approach strategy is considered as the most feasible, comprehensive and beneficial for organizations towards truly integration.

The content of the underlying MSS can then be assimilated by simply adding the corresponding clauses on top of the IMS model (Figure 4-5). Since MSS writers generally try to maintain consistency among the standards (Karapetrovic and Jonker, 2003), many of these standardized clauses are fairly similar, facilitating the process of identification and incorporation into the IMS. However, this simplicity can be deceiving. There are indeed elements in which the integration of content is not problematic and only minor adjustments are needed to cover all four standards. For example, "leadership" encompasses "management responsibility" and "management review", both elements being addressed by all four MSSs with basically the same wording. On the other hand, there are cases where the clauses are not that similar. Here, the "all-encompassing" integration approach is used to recombine requirements of each standard into a single clause covering all of them. For instance, describing training and competence for the IMS (Section 5.2.2) requires using this approach, combining the requirements established in ISO 9001 – Clause 6.2.2, ISO 14001 – Clause 4.4.2, OHSAS 18001 – Clause 4.4.2, and AA 1000 – Clause 12.5. In each of the standards, this elements is depicted with different coverage, ranging from the rather minimal "training programs including continuous learning" in AA 1000 to a much more comprehensive depiction in OHSAS 18001, where no less than four training aspects are required. Consequently, the IMS would impose the extent of the content for training as it is presented in OHSAS 18001.

When a particular element is not considered at all by one or more of the standards, the "all-encompassing" approach should be fully exercised to bring their benefits to the entire range of stakeholders. Two elements were identified to present this characteristic: "Emergency and preparedness" and "Social and ethical report", with the first considered in EMS and OHSMS, and the second only in CSRMS. Therefore, "Emergency and preparedness" would be applicable not only to environmental and health & safety aspects, but also to quality and social aspects. Thus, the IMS would ask an organization to have plans for dealing with emergencies of customers and society. This expansion of the requirement is beneficial to the organization, especially considering that customer

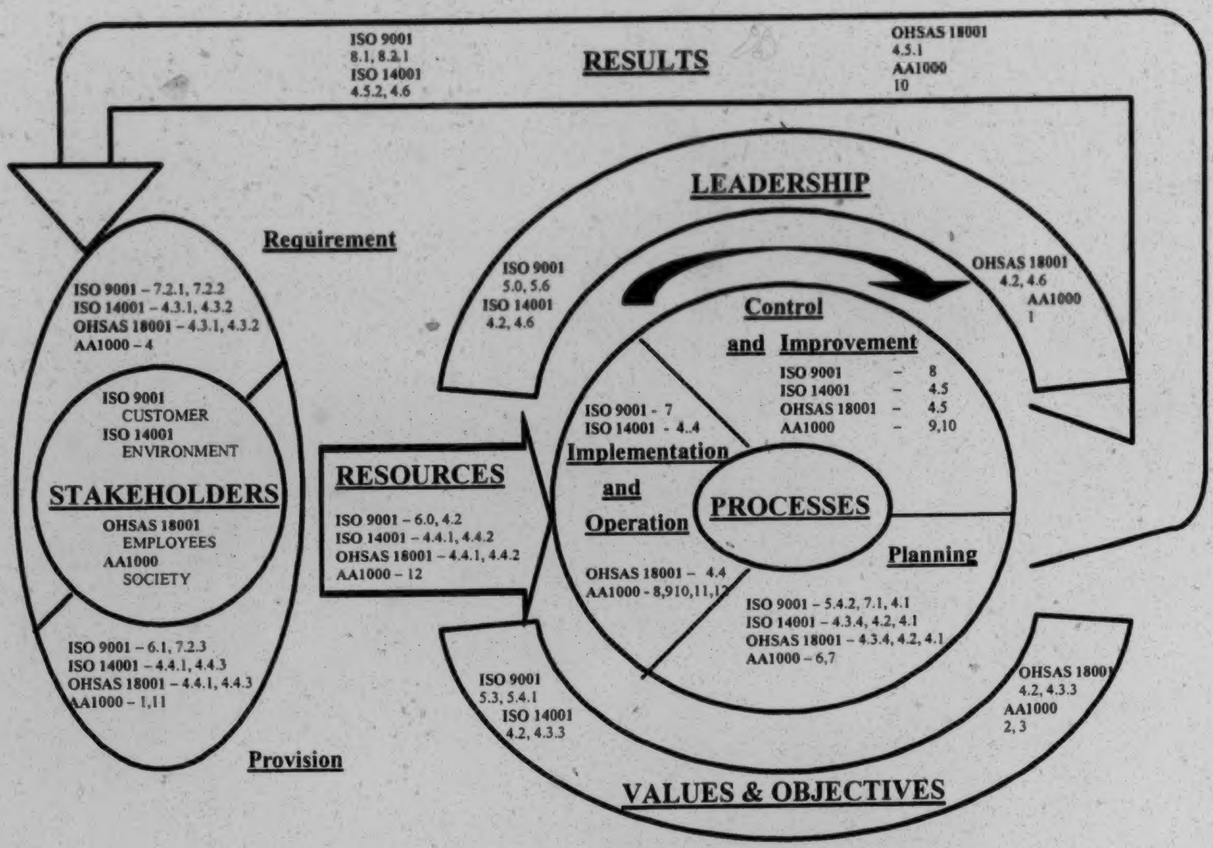

RESULTS
ISO 9001
8.1, 8.2.1
ISO 14001
4.5.2, 4.6
OHSAS 18001
4.5.1
AA1000
10
Requirement
ISO 9001 – 7.2.1, 7.2.2
ISO 14001 – 4.3.1, 4.3.2
OHSAS 18001 – 4.3.1, 4.3.2
AA1000 – 4
ISO 9001
CUSTOMER
ISO 14001
ENVIRONMENT
STAKEHOLDERS
OHSAS 18001
EMPLOYEES
AA1000
SOCIETY
ISO 9001 – 6.1, 7.2.3
ISO 14001 – 4.4.1, 4.4.3
OHSAS 18001 – 4.4.1, 4.4.3
AA1000 – 1,11
Provision
RESOURCES
ISO 9001 – 6.0, 4.2
ISO 14001 – 4.4.1, 4.4.2
OHSAS 18001 – 4.4.1, 4.4.2
AA1000 – 12
LEADERSHIP
ISO 9001
5.0, 5.6
ISO 14001
4.2, 4.6
OHSAS 18001
4.2, 4.6
AA1000
1
Control
and Improvement
ISO 9001 – 8
ISO 14001 – 4.5
OHSAS 18001 – 4.5
AA1000 – 9,10
ISO 9001 - 7
ISO 14001 - 4.4
Implementation
and
Operation
OHSAS 18001 - 4.4
AA1000 - 8,910,11,12
PROCESSES
Planning
ISO 9001 – 5.4.2, 7.1, 4.1
ISO 14001 – 4.3.4, 4.2, 4.1
OHSAS 18001 – 4.3.4, 4.2, 4.1
AA1000 – 6,7
ISO 9001
5.3, 5.4.1
ISO 14001
4.2, 4.3.3
OHSAS 18001
4.2, 4.3.3
AA1000
2, 3
VALUES & OBJECTIVES

Figure 4-5: The IMS "Motor" model and its founding MS standards

loyalty is built and maintained when customers perceive the organization is reliable enough to respond properly to their emergencies.

On the other hand, the production of a "Social and ethical report" is only addressed in AA1000. All four standards are requiring certain documentation and records, however, only AA1000, due to its underlying principle of accountability, places strong emphasis on releasing a report to the stakeholders. This report would contain, among other aspects, descriptive information of the organization and performance in selected indicators.

By applying the "all-encompassing' approach, the report of the IMS would also consider quality, environmental and health & safety in addition to the social and ethical issues. Broadening the scope of the report would probably enhance the credibility of the organization in the eyes of customers, government and other stakeholders.

Both elements would represent a significant benefit when applied to the whole spectrum of issues of the IMS rather than just minimizing them to their original scope. This benefit is not to be unheard by organizations.

Each element described in the IMS "Motor" Model, hereafter called simply as IMS Model, is formulated to cover the "all-encompassing" approach present in all four MSSs. The resulting objective and scope of each element is described in Section 4.9.

4.7 Verification of the IMS Model

As mentioned before, the IMS "Motor" model is the product of a series of three subsequent IMS models, which presented changes in terms of elements and configurations trying to find a suitable approach for integration. Model number two (see Appendix B-1) was presented to a Canadian group of quality experts, the ISO/CAC/TC 176 for validation purposes. This group, composed by 50 quality practitioners and researchers representing Canada in ISO meetings and resolutions, is considered to be a suitable forum, given their experience in the quality field and integration issues.

The validation was done through the application of a five-page questionnaire, attached in Appendix B-3. This questionnaire was designed using mostly a close-ended format, reserving open-ended questions to where none of the provided answer was correct. The objectives of this survey were:

1. Validate the elements included in the model are adequate to describe an IMS
2. Validate clarity in the model to present relationships
3. Gather input for improving perception.

To achieve this set of objectives, the questionnaire was divided in three sections. The first section contains five introductory questions to identify specific aspects of the respondent. The second section, consisting of eight questions, is aimed to know the level of knowledge of respondents on IMS issues. The last section addresses ten questions regarding to the IMS model designed in this investigation asking respondents for their qualitative insights on the IMS principles, elements and interactions. For further information see Appendix B-3

Eleven questionnaires were returned properly answered. Although not a high percentage, only 22 percent of the total, this sample is considered representative since people knowledgeable on integration issues is extremely limited. After analyzing the answered questionnaires, most of the results confirmed the assumptions made in the model about the elements already included as well as the relationships between such elements. Not surprisingly, the idea of using standardized MSs as building blocks for the IMS model is also shared by these experts who seen QMS, EMS and OHSMS as good alternatives to be part of an integrative model. Also, some ideas were provided to improve the overall representation of the system, specifically, to emphasis the role of stakeholders. For further detail in the survey, its analysis and results, the reader may refer to Appendices B-1 to B-3

4.8 Drafting The IMS Guidelines

After the validation, the main elements of the IMS were confirmed and a final configuration was established, defining the IMS Motor Model. This model should be further elaborated to describe each element, its procedures, linkages between elements, documents, and records specific. In other words, a set of guidelines is drafted. To do so, a procedure, shown in Figure 4-6, is followed:

1. Each of the seven elements of the IMS is compared against all four standards, identifying the particular requirements the element can be related to. For instance, "Resources", as element of the IMS, is found to be related to Section

6.0 of ISO 9001:2000; Clause 6.2.3 of ISO 14001 and OHSAS 18001:1999; Clause of AA1000 and Clauses of SA 8001.

2. A second level of the IMS model is defined, dividing each IMS element into a number of sub-elements from the identified requirements found in step 1. For instance, using the same element of "resources", the IMS model would deploy it into "human resources", "infrastructure", "provision of resources", and "information" sub-elements. If required, a third level of definition is also generated to provide further detail on complex sub-elements. Human resources is a good example of such complexity, requiring the creation of a third level containing sub-clauses for "competence and training", "involvement of personnel", and "maintenance of human resources".

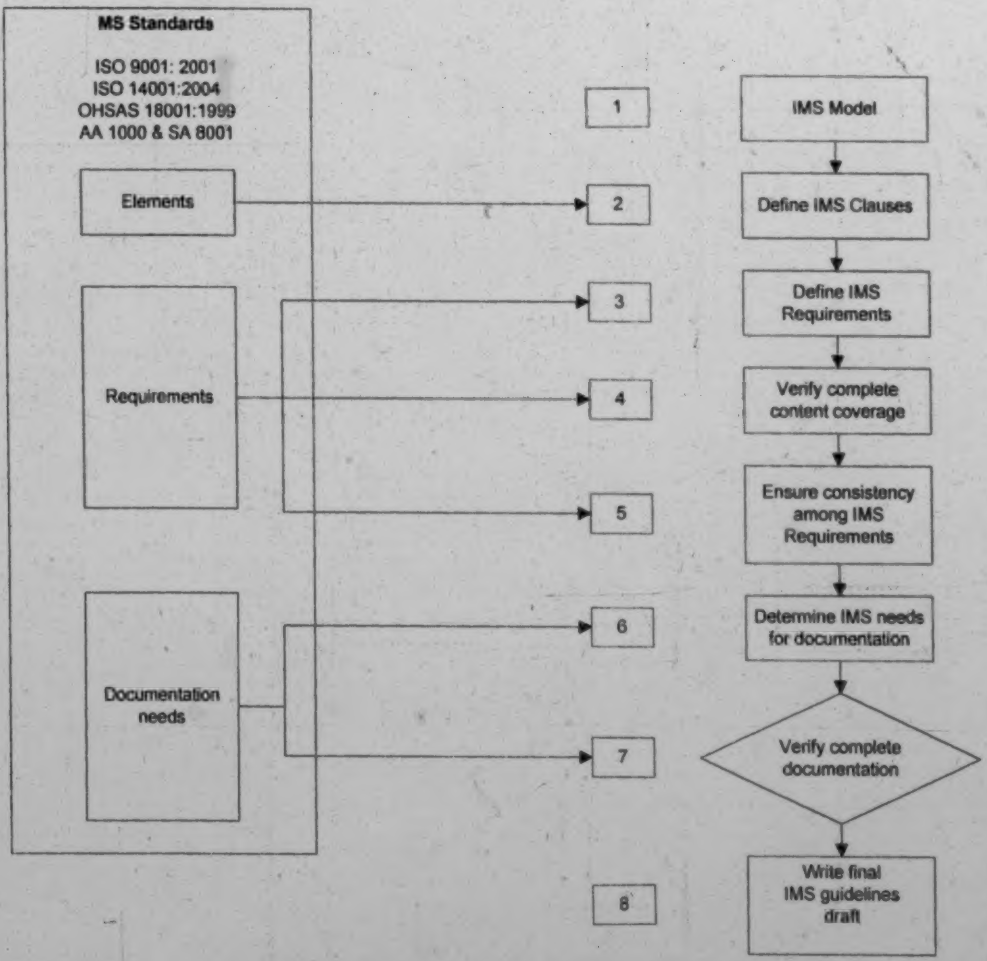

MS Standards
ISO 9001: 2001
ISO 14001:2004
OHSAS 18001:1999
AA 1000 & SA 8001
Elements
Requirements
Documentation needs
1
2
3
4
5
6
7
8
IMS Model
Define IMS Clauses
Define IMS Requirements
Verify complete content coverage
Ensure consistency among IMS Requirements
Determine IMS needs for documentation
Verify complete documentation
Write final IMS guidelines draft

Figure 4-6: Writing the IMS guidelines

3. Second and third-level sub-elements are populated by requirements that are defined applying the "all-encompassing" approach mentioned before to related standardized requirements. Wording at this stage is transcribed as found in the text of every standard. For example, "training" is defined by summing up the requirements set in OHSAS 18001 plus the requirements set in ISO 9001, which are complementary.
4. Next, a confirmation stage occurs, verifying that all related requirements have been properly included in both levels of sub-elements in function of scope and content. When a difference is found, this difference is corrected until every IMS clause includes, at the maximum extent, all related clauses of the analyzed standard. A complementary analysis ensures that for a particular standard, every clause has been considered within the IMS requirements. If (a) particular standard – clause(s) is/are found to be partially or totally missing, the corresponding correction is made. Both analyses are run in subsequent cycles for each of the remaining standards.
5. Since each requirement was literally transcribed from the standards, clarification and rewriting is required to ensure consistency within and with related requirements.
6. To define the information system, procedures, records and general statements are analyzed to determine those that, due to their relevance, must be documented. A table is elaborated listing all three types of documents, i.e. procedures, general statements and records, set in the IMS that are required for every requirement.
7. Documentation addressed in the IMS is compared against documentation required by each of the founding standards to verify whether or not the IMS complies with each standard in documentation needs for those companies looking for registration. A set of four tables illustrates how each document needed in all four standards is considered by the IMS (See Appendix A-4). For each standard a table addresses the Clause number where a documented procedure, a record or a general document is mentioned as mandatory.
8. For the final draft of the IMS guidelines, an analysis of the connections between elements is performed through the whole text. These connections indicate how a particular IMS clause impacts or is better described in another(s) requirement(s). For instance, when a particular activity requires the release of a record a reference is made to IMS *Clause 1.7*, which is where the information on how the

records should be kept and controlled can be found. The final draft of the IMS Guidelines is shown in Appendix A-5.

4.9 Comparing the IMS against a BEM

Nowadays, most organizations are searching for excellence in their operations and an IMS should serve to that purpose. A number of elements in the IMS model were incorporated attempting to provide it with sufficient features to be considered as a plausible stepping-stone for this search for excellence. For instance, "leadership" is enhanced, "values" and "objectives" are strengthened but, overall, the key enhancement is the inclusion of "results" as an integral and relevant element of the system. Standards such as ISO 9001:2000 are process-driven, containing no explicit reference to "system results" and limited to measure system's compliance with legal regulations, sometimes seasoned with a slim measuring of stakeholders' satisfaction. On the contrary, "Results", as mentioned in the IMS guidelines, basically considers two approaches: the first is to measure operational results, i.e. internal indicators the organization uses to know how each objective is being achieved; the second is to measure stakeholders' satisfaction, i.e. gathering information of stakeholders' perception such as customers and employees to validate the operational results. For instance, if a discrepancy between results and objectives exists, the organization has elements to know the causes and take the necessary measures to correct such breach. Thus, "Results" data closes the loop between an organization and its stakeholders, creating a favourable atmosphere for reaching excellence and major involvement of such stakeholders.

To compare the IMS model with an operational definition of excellence, a business excellence model (BEM) is chosen: the Malcolm Baldrige National Quality Award (MBNQA), a USA initiative for excellence. The MBNQA possesses an extensive literature on applications and methodologies for implementation. Its historical records to help organizations in the USA to improve are certainly impressive. All these qualities make it a suitable alternative for a BEM for comparison purposes with an IMS.

A desk-analysis was performed, comparing the IMS model with the MBNQA requirements looking for gaps between the two models and, more importantly, for possible paths for the IMS model to address those principles of excellence to promote improvement in the overall organization's performance. This comparison was done in the following categories:

a) Stakeholders considered

Stakeholders are more explicitly mentioned in the IMS model than in the MBNQA criteria. For the BEM the main stakeholders are customers (elements 1.2, 5.2, 6.1 and 7.0 entirely), employees (the entire element 4.0), and suppliers (element 5.4, 6.3). Environmental issues are only mentioned in element 1.3 contained within public responsibility. Social issues are relegated to a lone mention in element 1.3 (public responsibility and corporate citizenship). Occupational health and safety issues are included in element 4.4 (employee well-being and satisfaction). *In that sense, social and environmental issues are clearly more comprehensively and overtly managed in the IMS model.*

b) Assimilation, ascension and augmentation

To know the level of performance advocated by each model, the levels of assimilation, ascension and augmentation given in Section 4.2 and Figure 4.1 are applied. For ascension dimension, the BEM ranks higher since all its elements are designed to achieve excellence while the IMS is ranking lower but with the possibility of an upgrade, the pursuit of an E-IMS, if the third phase of the methodology (see Chapter Five) is fully implemented. Regarding to assimilation, the BEM integrates the QMS to the overall business systems but still leaving out Social and Environmental MSs whereas the IMS is expected to rank higher as a consequence of its approach for integration of four management systems, which includes social and environmental issues. Finally, in what augmentation refers, the MBNQA goes beyond ISO 9001 for implementing quality in an organization. However, for the remaining three MSs the BEM falls short in reaching the same level of augmentation. On the other hand, the IMS achieves all four management system to the minimum requirements but their expansion is left out to each organization's consideration.

In summary, each model has strong and weak points in all three dimensions. *For an IMS that covers only the minimum requirements set in the standards, an S-IMS, the scope is broader than the one addressed by the BEM. However, the depth of* *performance is left at minimum requirements in the S-IMS as established in its guidelines.* To go further, an organization must include excellence principles.

c) Methods for assessment

The methodology for assessment utilized by the MBNQA is representative and general for any BEM: Self-assessment. Done mainly by the own organization, self-assessment produces results using the score set for each element addressed in the model. On the other hand, evaluation of a resulting S-IMS is done through auditing techniques and no score system is provided to see to what extent is the implemented system covering or going beyond of the requirements set in the model. However, an IMS can benefit from the application of self –assessment techniques, to evaluate organizations' conformance to the S-IMS and E-IMS. The methodology for implementing an IMS, described in Chapter Four, includes self-assessment as an upgrade for auditing in the third phase (Enhancing the IMS). Therefore, *the BEM represents a more advanced model than the IMS model for assessment purposes*

d) Measure of performance

The MBNQA explicitly measures the performance of an organization in element 6.0 (Business results) and element 7.0 (Customer focus and satisfaction). Business results measures the product and service quality results, operational and financial results, and supplier performance results. On the other hand, the IMS goes further than a normal standard by actually measuring results (element 7.0): Operational and stakeholder satisfaction. Operational results include environmental, health and safety, quality and social indices and Stakeholder satisfaction measures customer and employee satisfaction. Both model addresses customer satisfaction but more thorough requirements for measuring it are addressed in the MBNQA. The *BEM is also more demanding on measuring results of financial, quality and supplier performance. However, the IMS requires measuring environmental, health and safety and social performance, which is missing in the BEM.* Also, employee satisfaction is considered as important as customer satisfaction in the IMS but not in the BEM.

e) Benchmarking

When measuring results, the MBNQA requires comparing the organization's results against best-in-class in the sector or applicable. This point gives an organization some pointers to know how the organization is doing compared with the sector or industry. Improvement strategies and setting of objectives are a valuable outcome of such comparison. Benchmarking is not a part of the core elements of the IMS. However, the methodology does include a section for those organizations that are willing to go beyond minimum requirements. On the third phase of such methodology benchmarking techniques are incorporated to provide points for comparison against best in class (See Chapter Five).

As expected the BEM is more comprehensive than the IMS in most of the categories used for comparison. However, the IMS also provides some benefits that even the MBNQA does not considered or at least, not in the same level of relevance, e.g. social and environmental issues. Aspects that are the trademark of the BEM can be also utilized in the IMS when the third phase of the methodology is implemented (See Chapter Four). Benchmarking, self-assessment and learning principles are possible upgrades that an organization may select to enhance their IMS and facilitate the achievement of excellence. Therefore, an IMS can be considered as a viable stepping-stone for building excellence in an organization, not only in quality and customer related operations but also in environmental and social related.

4.10 Summary

In this chapter, the need for an Integrated Management System (IMS) model was explored and four MSSs were selected to create it. The Quality Function Deployment (QFD), a quality methodology applicable to design quality into final products, was adapted to design the IMS model and the subsequent methodologies for implementation and auditing. A set of IMS principles and IMS model elements is obtained from this QFD application. The final IMS model is configured by taking those IMS elements, arranged into a generic framework, and filled with requirements taken from the original MSSs using an all-encompassing approach. The IMS model also is verified by a group of Canadian quality experts who are engaged in the design and update of quality standards at the national and international level. The following chapter presents the IMS implementation methodology, the second component of the IMS conceptual framework.

5. An IMS Implementation Methodology

5.1 Introduction

This chapter describes the design of a methodology for implementing the IMS model developed in the previous chapter. First, the need found in the literature survey (Section 2.8) for a generic IMS methodology applicable to a broad diversity of organizations in the business community is discussed. Consequently, a number of concepts and techniques are discussed: iterative loops, to bring flexibility and redundancy; learning curves, to include skills mastering and to explain time savings; PDCA cycle, to serve as management common language; and the IMS principles or "basics", to provide comprehensiveness and guidance for integration. This set of concepts will be applied to the sequence of implementation to provide the required flexibility of the overall IMS conceptual framework. In defining the activities of the IMS implementation methodology, the QFD previously developed in Chapter Three is expanded further, creating a third HoQ. Finally, the methodology is structured by deploying the activities found in the third HoQ into a three-phased configuration harnessed with an iterative and control loops to provide the required flexibility.

5.2 Supporting Concepts

Due to the emerging nature of integration as an alternative to mitigate MS isolation problems, a potential IMS implementation methodology has to include techniques and concepts to deal with them, thus increasing the probability of having an overall higher performance of the organization. For instance, by using the QFD technique the methodology is linked to the IMS principles and IMS model, creating a solid proposal for integration. The inclusion of the PDCA cycle is intended to provide an understanding of this basic management concept for those organizations that are not familiar with ISO or similar standards or to enhance their use to those organizations that already have one or more ISO or similar standards. Each concept is explained in the following sections, emphasizing particular problems tackled and benefits achieved by its inclusion (See Table 5-1).

Concepts included	**Purpose for inclusion**
QFD	• Provide elements directly related to the IMS model to assure comprehensiveness
PDCA Cycle	• Facilitate implementation process for organizations with few or none experience on ISO or similar standards • Build over the current experience for those that already have implemented this sort of standards.
IMS Principles	• Master skills and competences to improve use of resources and overall performance of the system
Excellence principles and techniques	• Increase the level of performance and maturity of the resulting IMS
Phasing	• Organizations can decide to have an IMS at minimum requirements or going further for excellence
Iterative loop	• Possible to use regardless on which MSs and level of managerial maturity the organizations has at the starting point • Address any sequence of integration
Learning curve	• Facilitate comprehension of learning processes • Increase experience and mastering of basic management concepts • Reduction of overall costs of implementation to those resulting from isolated implementation processes • Reduction of the time employed in overall implementation
Negative feedback loop	• Provide mechanisms of control to make sure objectives are achieved and take corresponding actions when necessary

Table 5-1: Set of concepts supporting the IMS methodology

5.3 Defining Methodology Elements

5.3.1 QFD

The same QFD process over which the IMS model was first developed is extended to create a third HoQ which will define a set of steps to produce a wholesome IMS (See Figure 5-1). A matrix is created to embody this third HoQ. First, the seven elements of the IMS model are listed in the first column; although this time they are listed in the first row of the matrix. Later, in the first column, the activities for implementation are listed in orderly fashion so the first ones to be done are listed first. Finally the interactions between first column and first row are explored, looking for those where strong and medium links exist. Each element of the IMS model is implemented by one or more of the eighteen activities of the IMS implementation methodology. This third House of Quality also illustrates the strength of relationships between the activities of the IMS implementation methodology and the elements of the IMS model. Further information of the eighteen activities will be provided in Section 5.5

5.3.2 PDCA Cycle

The PDCA cycle, also known as Deming or Shewhart cycle, is a basic management concept. Basically, it advocates that any project or activity, regardless on their size and type, can be properly managed through a cyclical set of four activities: Plan–Do–Check–Act (Shewhart, 1986). Each step in the methodology can be planned, done, verified and ultimately corrected or improved according to this cycle. For instance, the first activity of the IMS implementation methodology, "Obtaining top management commitment", would be done first programming a set of presentations to top management (planning); next, presenters would be are prepared, material would be gathered and linked all together and presentations would actually be shown to top management (doing); then, people responsible for the presentations would verify the perception and response from top management, drawing conclusions on what action to take (checking); finally such actions, that can involve new presentations or the actual release of resources towards the IMS implementation as part of company's strategy, would be developed (acting).

This concept is amply used through this research: embedded in the IMS model itself, driving the set of processes (See Section 3.6.5.1); appears in each step of the methodology, coordinating all those procedures and also to develop the big picture, the sequence of steps and phases. By applying this concept over an over again, at strategic, tactical and operational levels, an organization will develop strong managerial skills or "muscles" to improve the overall performance.

IMS IMPLEMENTATION METHODOLOGY	IMS ELEMENTS					
	Leadership	Values and Objectives	Stakeholders	Resources	Set of Processes	Results
Obtain Top Management Commitment	◎					
Perform Initial Review	◎	◎	◎	◎	◎	◎
Outline IMS implementation	◎	◎				
Enhance Top Management Leadership	◎	○	◎			
Identify Stakeholders and Initiate Communication	◎	○				
Define Values and Objectives	○	◎				
Identify and Plan Set of Processes			◎	◎	◎	
Provide Training and Awareness to Employees	◎			◎	◎	
Gather Necessary Resources	○		◎	◎		
Implement New or Modify Existing Processes				○	◎	
Operate Existing System	◎	◎	◎		◎	
System Auditing	○				◎	
Measure Stakeholder Satisfaction		◎	◎		◎	◎
Identify Causes for Underachievement		◎			◎	◎
Integrate remaining MS into the IMS	◎	◎	◎	◎	◎	◎
Implement an Integrated Performance Measurement System		◎				◎
Implement self assessment cycles		○			◎	◎
Benchmarking for improvement					◎	◎

Figure 5-1: Third House of Quality – The IMS methodology

5.3.3 The IMS Principles

Implementing an IMS model, with such broad range as considered in this research, requires to master the basic principles upon it has been designed. Each action of the methodology would be supported by the IMS principles found in the first HoQ (See Section 3.7.1). The continuous exercising of these IMS principles would facilitate the understanding, training and implementation of the IMS models, in a similar way that the eight ISO management principles is facilitating implementing a QMS following ISO 9001:2000 requirements (West, 2000; Liebermann, 2002). For instance, "process approach", one of the IMS Principles, provides guidance to employees in seeing the organization performance in terms of sequence of interrelated activities rather than isolated functional activities. Integration of subsequent processes and management systems requires from employees to consider how specific activities affect and are affected by related activities along those processes.

All the IMS Principles are included, at one time or another, throughout the entire sequence of implementation of an IMS. Further detail is included in Section 4.5, where each step of the methodology is explained and illustrated.

5.3.4 Improvement Techniques

Meeting stakeholders' requirements as stated in contractual and legal regulations does not longer guarantee to an organization to survive in the future. The initial scope of the IMS model aims to satisfy only those requirements of stakeholders, similarly to the original standards. However, the IMS implementation methodology should also include operational techniques that enable an organization to go beyond such minimum requirements. Self-Assessment, frameworks for an integral performance measurement and benchmarking are techniques to be included to enhance the performance of the resulting IMS towards a higher level of satisfaction of targeted stakeholders (See Section 4.5.3 for further detail).

5.4 Defining the structure

5.4.1 Phasing

The set of steps, consequential from exercising a QFD, needs to be clustered, creating groups of related-activities and setting clear milestones in the road towards integration. Each of these groups, called phases, will have clear purpose(s), procedure(s) and outcome(s), leading to a point where top management would take a decision that will set the pace and extent of the following phase. Having clear milestones help organizations to identify their situation regarding integration and motivate them to go further. Figure 4-3 will illustrate the road towards integration and its relationship with the methodology.

At the beginning (T_0), a company will likely have "x" number of systems, each at different levels of maturity, from null or simple programs implemented only for regulations purposes to those complying international standards or possibly beyond. This management status is hardly the same in any other organization, even under similar circumstances. The methodology, recognizing this fact, starts by collecting all the information necessary to outline an IMS that is suitable and convenient to this specific company. A phase should group all these activities until this point.

At T_1, the methodology has led the company to design, implement and integrate a number of MSs into a single, overarching system, an IMS. This would be another phase, grouping activities of implementation, operation and control. The resulting system meets the requirements as set in the IMS model guidelines, described in Appendix A-5, being certifiable to any of the international standards considered in the model, e.g. achieve ISO 9001 when certifying company's QMS. However, the IMS only contains minimum requirements of selected stakeholders and even though they may bring a good level of performance, the changing and more challenging market and society will undoubtedly seek for more than minimum requirements. A company that wishes to continue working and growing would look for delighting its stakeholders.

From T_2 and up, the company will enhance different aspects of its IMS, looking for better performance and continuous improvement. Excellence techniques and principles are suggested as part of such enhancement. A number of activities can be here grouped to provide a clear road towards enhancement of integration. This enrichment is illustrated in

Figure 4-3, at T_2, where is clear that the IMS reaches levels of excellence becoming into an E-IMS (Enhanced Integrated Management System).

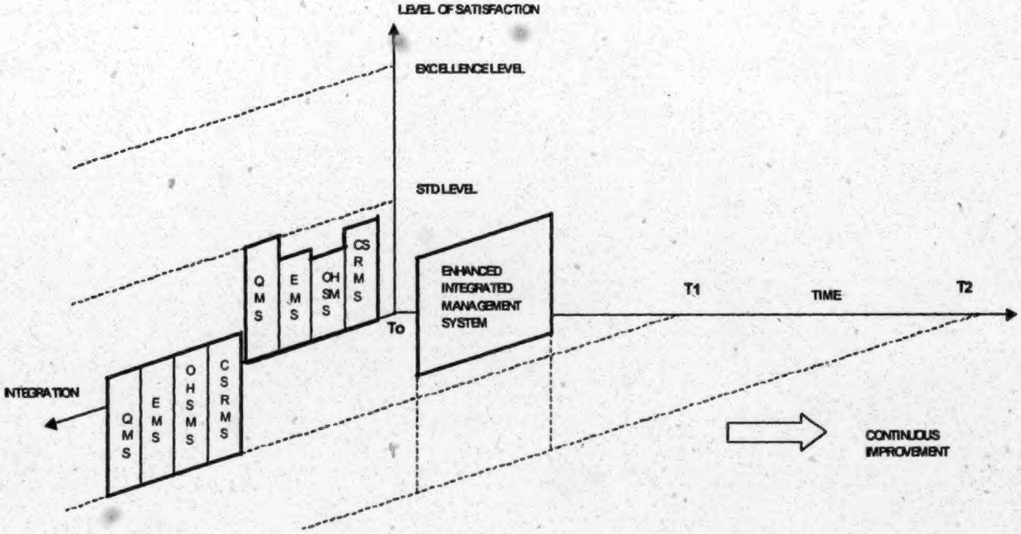

LEVEL OF SATISFACTION
EXCELLENCE LEVEL
STD LEVEL
QMS
EMS
OHSMS
CSRMS
To
ENHANCED INTEGRATED MANAGEMENT SYSTEM
T1
TIME
T2
INTEGRATION
QMS
EMS
OHSMS
CSRMS
CONTINUOUS IMPROVEMENT

Figure 5-2: Road Towards Integration

As Figure 5-2 suggests, the methodology will contain three phases, each designed to pursue specific objectives and therefore, having distinct activities and procedures. For instance, the first phase is wrapped around planning the IMS, leading to a point where organizations must decide basically the scope, extent and sequence of integration of its IMS whereas the second phase, bounded by those decisions, conducts the organization to implement an IMS set at minimum requirements. To embark for the third phase, the company must decide they want to go further, shooting for the stars, metaphorically speaking, by enhancing the IMS with tools for excellence.

5.4.2 Iterative loops

In the previous section, three phases were identified in the road towards integration. Although all three of them are important it is clearly the second phase where flexibility for final scoping and sequence of integration happen. A simple, sequential set of activities would most likely miss such flexibility, thus an iterative loop is considered an excellent option to provide this flexibility.

Basically, an iterative loop, commonly used in system design and software programming, allows to certain parts of a procedure to be repeated many times until a specific condition is met, e.g. a specific number of iterations or when a variable reaches a specific value. In the methodology, an iterative loop will be included in the second phase to repeat it until the number of MSs, set as the final scope of the IMS, is reached, one MS at a time.

The first time an organization goes through this loop, a specific management system, probably the one that is more advanced or more necessary at the time, is implemented to the extent of requirements defined in the IMS guidelines. The subsequent cycles are meant to incorporate the remaining MSs to the initial one, thus integrating them and creating the IMS. The number of cycles is the same to the number of management systems meant to be integrated and can be broadened to assimilate more MSs if considered opportune. This iterative nature of the second leg brings about some benefits such as learning through practice, which is the concept illustrated in the next section.

5.4.3 Learning curves

As a result from the introduction of an iterative loop within the methodology, an organization is likely to repeat the same activities, and apply the same IMS principles, a number of times, thus mastering the basics of management systems, and hopefully achieving a reduction of overall implementation costs, resources and time with a steady improvement in overall performance. This phenomenon is a well-known and sought in management and training: the learning curve of training.

In a learning curve it is recognized that recurrence of the same activity results in a decrease of time and effort expended on the next activity cycles. A person or entity performing the same activity over and over learns how to do it and the basic skills behind it. The reduction in time or effort is exponential and reaches eventually a plateau to the level of capability of the system. Applied to the IMS, this means that an organization implementing two or more MSs into an integrative framework should eventually reduce the time of implementation, the stress and effort and improving the quality of the implementing process as a whole. How drastic the reduction of time, efforts and costs will be depends on several factors: relationships with stakeholders, management styles and learning approaches. Figure 5-3 is a graphical representation of the learning curve applied to the implementation of an S-IMS. Between the first and last MS a visible reduction on the time of implementation is acquired, which can be translated in costs of implementation.

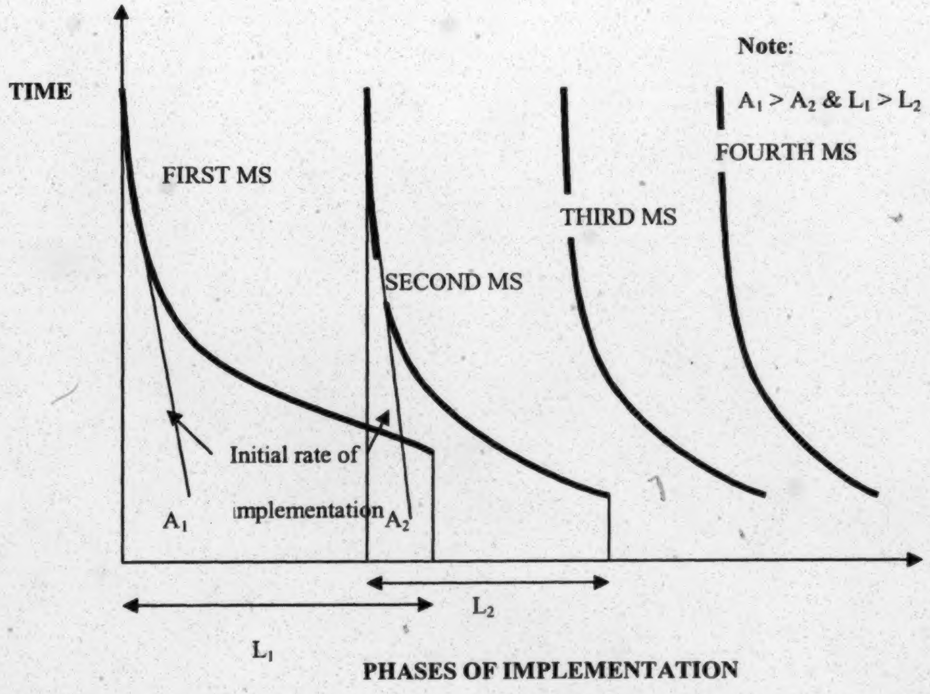


Figure 5-3: Learning curves when implementing an IMS

5.3.4 Negative feedback loop

An organization, when implementing an IMS one MSs at a time, would like to verify if the system is complete (one verification) and if it is capable to satisfy the stakeholders according to the planned level (another verification). To do such verifications, a negative feedback loop is required (See Figure 5-4), allowing the IMS implementation methodology to correct the conditions, e.g. missing elements, which have led to lower than expected levels of performance. A couple of negative feedback loops will be included in the IMS implementation methodology to assure required actions are taken when the system is incomplete or underperforming the selected stakeholders.

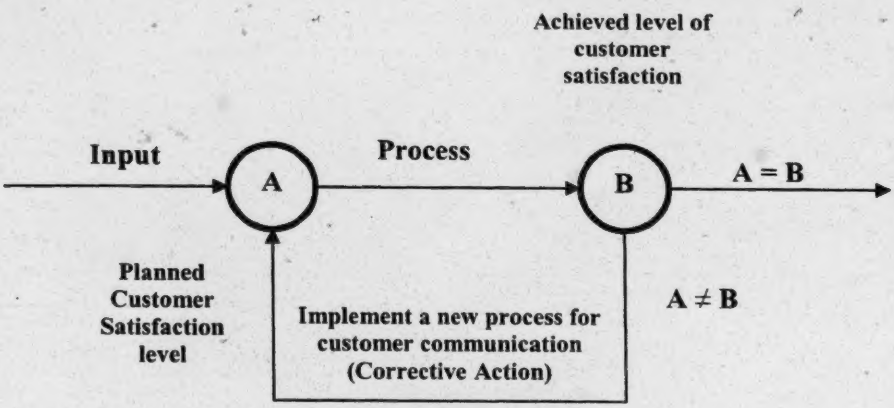

Achieved level of customer satisfaction
Input
A
Process
B
A = B
Planned Customer Satisfaction level
Implement a new process for customer communication (Corrective Action)
A ≠ B

Figure 5-4: A negative feedback loop

5.4 A Three-Phased IMS Methodology

With the help of supporting concepts, explained in previous sections, an IMS implementation methodology is outlined. The array of activities defined in the third HoQ is taken and deployed into a meaningful, clear-cut, flexible and iterative sequence. Figure 4-6 shows the resulting sequence grouping the steps in three phases clearly defined; each one of them with particular objectives and outcomes.

While Phase I and Phase III are mostly straightforward, Phase II contains an iterative loop and two negative feedback loops. Figure 5-5 illustrates Phase I as a four-step block for designing an IMS where scope and sequence of integration are defined according to organization's own needs. Phase III is a three-step block addressing principles and techniques of excellence, intended to facilitate the organization pursuit for higher levels of performance and, ultimately, of stakeholders' satisfaction.

Phase II deserves a lengthier explanation. Designed to implement and integrate the IMS to the specifications set in Phase I, the second leg in the roadmap is more dynamic. It is designed as a long iterative loop, controlled by the number of MSs to integrate. Since usually the MSs are integrated one by one, the cycle will occur as many times as the number of MSs to be included. Also included in this phase are two feedback loops: the

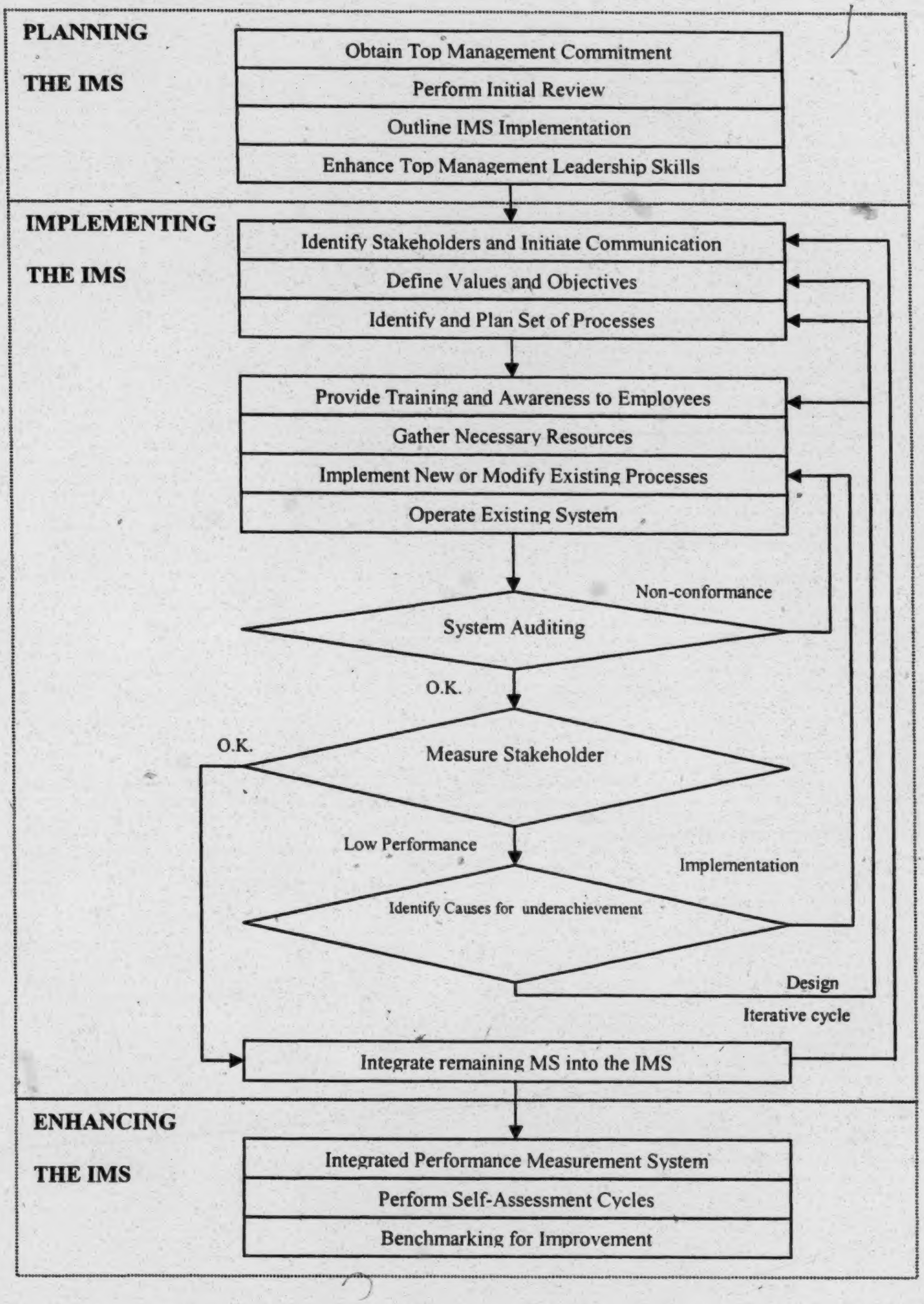

PLANNING
THE IMS
Obtain Top Management Commitment
Perform Initial Review
Outline IMS Implementation
Enhance Top Management Leadership Skills
IMPLEMENTING
THE IMS
Identify Stakeholders and Initiate Communication
Define Values and Objectives
Identify and Plan Set of Processes
Provide Training and Awareness to Employees
Gather Necessary Resources
Implement New or Modify Existing Processes
Operate Existing System
Non-conformance
System Auditing
O.K.
O.K.
Measure Stakeholder
Low Performance
Implementation
Identify Causes for underachievement
Design
Iterative cycle
Integrate remaining MS into the IMS
ENHANCING
THE IMS
Integrated Performance Measurement System
Perform Self-Assessment Cycles
Benchmarking for Improvement

Figure 5-5: The IMS Implementation Methodology

first one used for comparing performance of the MSs against their objectives while the second is employed to identify the causes for lower levels of performance and redirect the process until the objectives are achieved. Having these loops integrated in its structure gives the methodology the ability to be applied to any sequence of integration in any type of organization. However, further detail is required to provide a complete methodology so organizations know what to expect at a given time in the road for integration.

The final methodology is described below. Each phase is described in general terms followed by a break down into their corresponding steps, which are described using a framework illustrated in Table 5-2. Aspects such as purpose, procedure, resources, techniques, IMS basics used, IMS element targeted, outcomes and hints/tips are included in this framework, characterizing each step. Although extensive, no claim is made of being an all-inclusive list and organizations may use other techniques.

5.4.1 First phase – Planning the IMS

In the first phase, the organization should defines whether to embark or not in the integration journey. If top management, seeing integration as beneficial for the organization, agrees to implement an IMS resources should be assigned and released towards integration. Top management's first task should be planning and performing an initial review against the requirements set in the IMS guidelines. From the results of such review gaps in the management elements would be discovered and defined and an IMS implementation plan would be outlined. This plan should specify the MSs to be included, the sequence of assimilation, and a program, based on the IMS implementation methodology, to control the implementation process. This program should start by enhancing leadership skills and competences of top management showing to the whole organization the importance of this project to the organization.

At the end of this phase, an organization-specific IMS would be defined, establishing what the MSs will be included, the scope given within the organization, i.e. facility bound and the sequence of integration. A program to fill the existing gaps would be prepared, detailing resources, activities and timeframes.

Aspect	Description
Purpose	What are the goals for each activity? They are established and linked to the necessary inputs from previous stages, laying the network of activities. If required, here should be included any differences that may happen from one cycle to other.
IMS Element	How each step is helping to build (a) particular element(s) in the IMS model? This includes particular sub-elements or clauses as they are called in the IMS model. Also mentioned here is the involvement of a particular element as a provider.
Resources	What are the required resources to be used for each specific step? The main resources are listed so that an organization can compare them against its own inventory, visualizing their own needs. Among resources listed are human, technology and infrastructure in general
Techniques	What are the methods and management tools to be used? A list of possible techniques and methods is provided. Although not all-inclusive it aims to provide a guide on the basic and up-to-date tools for collecting, analysing information and making decisions.
The IMS principles	What are the basic IMS concepts used and mastered in this step? The IMS is built over a set of principles and each step requires the use and mastering of some of them by the employees, hence, saving time and resources in subsequent applications.
Documentation	What documentation is required? As part of the information system, each step would need documented procedures, documents and records as the IMS and the organization's own needs dictates.
Procedure	What activities are involved? The sequence of tasks required for each step is described using the PDCA as blueprint to facilitate their understanding and implementation.
Outcome	What is the expected outcome? Each step produces a particular result, e.g. a process, document, analysis or resource, which is later used in one or more of the following steps.
Aspects to look for	Some hints and tips are mentioned to help organizations to be aware of potential obstacles or opportunities that may emerge. This list is based on previous experience with standardized MSs (See section 2.4.1).

Table 5-2: Characteristics defining an IMS implementation methodology

5.4.1.1 Obtain Top Management Commitment

The main purpose at the beginning of the road is to involve the decision-makers in the organization, i.e. top management and the Board. Before going any further, top management should demonstrate its commitment towards considering integration as an added-value business strategy. To obtain such commitment, presentations and supporting material should be developed. These presentations may contain, among others, strategic analysis on environmental, occupational health and safety, quality or social issues; needs and opportunities for improvement and the benefits from integration. Once top management is persuaded of the possibility and benefits from achieving an IMS, they should start planning the whole process and communicate it to the organization and external stakeholders looking for their support (See Appendix C-1).

5.4.1.2 Perform Initial Review

An extensive review or audit should be top management first task. This review aims to find the status of the initial management systems in the organization against the IMS requirements described in the model and guidelines. The broad scope of the analysis would require of extensive resources and possible participation of external entities such as consultants, academics, governmental officials, advocate groups, watchdog groups, associations and others with the necessary expertise. The organization should bear in mind that the usefulness of the review and quality of decisions derived from it depends highly on its thoroughness and objectivity. At the end, a report listing the findings, gaps, strengths and weakness should be delivered to top management and the Board. The content of the report should emphasize requirements already mastered, to leverage further development, and those in need of fully implementation or radical change, to assign enough resources and exercise tighter controls (See Appendix C-2).

5.4.1.3 Outline IMS Implementation

Top management should define which management systems to be integrated, e.g. quality, environmental and health & safety. When social responsibility is included in the scope of the IMS, the length of its scope should be clearly defined, e.g. labour issues, corporate governance. The scope of the IMS would reflect the priorities of the company and its strategy for improvement. In deciding the final scope, top management should have relevant information obtained from three sources: market information, initial review of organization's capabilities and the overall organization's objectives. This information should be analyzed and leading to define those MSs to be included, the sequence of assimilation, the resources to devote, responsible for the project and the activities to perform. The methodology here presented is strongly suggested as the blueprint to allocate resources and control progress (See Appendix C-3).

5.4.1.4 Enhance Top Management Leadership Skills

Since integration is bound to break models and ways of thinking, top management should be prepared to deal with such changes. On the other hand, top management should demonstrate, in visible manner, its commitment towards integration. Employees and stakeholders would need assurance of the importance of this initiative, especially when such organization has had trouble implementing MSs before. Therefore, enhancing leadership by training, seminar or other means would help to achieve both goals and a plan should be developed based on the results of the initial review. Topics of training may include: techniques for effective communication, employee empowerment, integral measurement of performance, measurement for improvement, management styles, and leadership styles. Top management could be trained in these and other topics using formal training, awareness sessions, seminars, workshop, presentations, courses, web-interactive events (See Appendix C-4).

5.4.2 Second phase – Implementing the IMS

Having the general specifications for an IMS outlined, the organization would start with the implementation process, one MS at a time and repeating the cycle until the IMS is complete, according to such specifications. First, the organization should identify those stakeholders targeted by each subsequent MS, building channels of communication with them so their requirements should be defined and confirmed, in a regular basis. For following MSs, some stakeholders may need to be included again, but looking to define other sort of requirements. It is at this moment when truly integration begins. For example, when integrating social and health & safety systems, employees should be targeted by both MSs to manage their labour rights and well-being at the workplace. As a result of this identification exercise, stakeholders' requirements would be used "to pull" the organizational infrastructure required to meet them.

A proper organizational culture is required to implement those new concepts such as process approach, integration, and holistic view rather than local. These conditions could be reached through defining, deploying and communicating a comprehensive set of values the whole organization and involved stakeholders. This set of values should be flexible enough to allow the IMS to adapt according to requirements and circumstances faced by the organization when integrating subsequent MSs. These values -written as principles, policies, vision, and mission statements- should immediately be deployed into objectives and tied up to the organization's and employee's performance.

The initial review would facilitate to identify the gaps within organization's processes, both operative, e.g. production, and supportive, e.g. administration. To fill out such gaps first resources should be assigned and deployed. First, as the main asset in the organization's resource pool, should be trained in the new objectives, changes in processes, procedures and techniques to integrate new activities and approaches. Complementing resources should be also gathered from involved stakeholders to have: equipment, techniques, technology, information and other infrastructure required to put the processes in place. Next, top management should deploy all these resources within the processes following the blueprint set in the IMS model and the particular conditions of the company. Later, those processes should be run through a number of cycles so that a complete set of results is produced. Here, the IMS implementation methodology suggests making some verification to see whether the system is fully implemented and whether it is delivering levels of performance as planned.

Two verifying activities would be done. For the first verification, an audit should be done, comparing the resulting IMS with the IMS model. If the audit reveals some non-conformances in the system, the implementation process should be repeated until the system proves to be complete. For the second verification, the performance of the resulting IMS is compared against initial integral objectives. If the results are below the minimum expected performance the system should be analyzed to discover whether the problem lies in execution of the IMS implementation plan or in the design of such plan. When the problem is tracked down to execution, implementation should be reviewed and re-done when necessary. On the other hand, when the cause has been identified to be the IMS implementation plan design, both IMS objectives and IMS plans are reviewed and changed as required. This process would be repeated until the MS in question is fully integrated into the IMS and the stakeholders are satisfied.

The entire cycle should be repeated all over again, adding MSs until the IMS is complete. At this point top management should decide if the IMS should be left at this level or enhanced by the inclusion of principles and techniques for excellence. For further detail on each stage, refer to Appendix C (From appendices C-5 to C-15).

5.4.3 Third Phase – Enhancing the IMS

At this time, an IMS should be already in place, operating to meet stakeholders' requirements as they are considered by the underlying standards. At this level of performance, the system is called S-IMS (Standardized based IMS). However, the IMS model allows to go further looking for what was called "ascension" to strive for excellence in organization's activities (See Figure 3-2). At this higher level of performance, the system is renamed E-IMS (Excellence IMS). The organization should decide whether to settle for this currently achieved S-IMS or going for the E-IMS, thus enhancing it with specific techniques looking to deliver excellence to stakeholders. This last phase can be defined in three words: measuring, learning and validating.

The IMS implementation methodology establishes the need to develop a performance measurement system that is adequate to evaluate the IMS in its wholeness, addressing a balanced set of measurements along the organization. This subsystem should be adapted to the particular necessities of the organization in terms of the IMS scope and closely linked to the overall business management. It should be deployed into all levels, having all employees using it and stakeholders being aware of. The continuous information coming from the IMS performance would have significant impact on the organization, looking for areas of improvement and input for organization's learning. To do so, the organization should implement training programs and foster learning, sharing and embedding of the core competencies and methodologies that have proved successful in particular areas, spanning through the entire organization.

Next, the IMS implementation methodology suggests implementing self-assessment cycles, looking to involve employees not only in the evaluation process but also resulting in critical thinking and active inputs for improvement. The organization should firstly direct these self-assessment cycles to areas with more experience and better chances to succeed to, later, eventually the entire IMS. Having employees involved in this evaluation process may result in greatly involvement in organization's improvement actions since these actions came in first place as result of employee's suggestions and recommendations.

Also, looking to achieve higher levels of performance, the organization may include techniques to compare specific areas of performance with those of organizations recognized as the 'best' in the field. The IMS implementation methodology suggests using benchmarking to do this comparison in a continuous basis, targeting particular stakeholders and requirements each time. For instance, an organization wishing to improve their delivery service, a quality factor for them, may use benchmarking to obtain data of FedEx performance as well as their delivery processes; later, this information would be analyzed and new objectives and processes might be adapted to the particular conditions and objectives of the organization. In time, benchmarking the IMS performance in an organization could be a suitable objective, when an increasing number of organizations have also integrated their systems.

Achieving higher levels of performance of an IMS implemented at standardized requirements does require a more proactive approach than the one required for an S-IMS. Further detail on each of the three stages for this third phase is provided in Appendix C (from C-16 to C-18). Integrally monitoring and measuring activities and stakeholders' levels of satisfaction, involving employees in evaluation and improving activities and establishing new levels of performance and processes to achieve it are strategies that can facilitate an IMS to reach levels of 'excellence' as mentioned in the European Foundation for Quality Management (EFQM) Model and Malcolm Baldrige National Quality Award (MBNQA) Model for the particular processes forming such IMS.

5.5 Summary

Supporting the IMS Model, a three-phased IMS Implementation Methodology is developed in this chapter to provide organizations with a set of guidelines on how to implement an IMS. This set of guidelines is configured in three different phases, each with clear milestones. First, it identifies the organization's needs and develops an implementation plan. Second, it implements an IMS that meets stakeholders' needs as expressed in the original MSSs (S-IMS). Finally, it also shows how an IMS may be enhanced (E-IMS) by integrating some business excellence concepts. Control and iterative loops are included in the second phase to adapt the IMS to particular needs.

6 Auditing an Standardized IMS

6.1 Introduction

This chapter describes how auditing concepts, techniques and methodologies are translated from how they are being done in particular management systems to the particular IMS conditions and purposes. The result is the Auditing Management System (AMS) Model that should be able to audit an IMS under different conditions, that is, auditing a full IMS with different combination of MSs or auditing any MSs in a separate way. Figure 6-1 presents both applications for auditing an IMS: a single environmental management system audit (at the left side) and a fully IMS audit (at the right side). To create this Auditing Management System (AMS) Model, the research methodology described in Section 3.5.3.1 was followed.

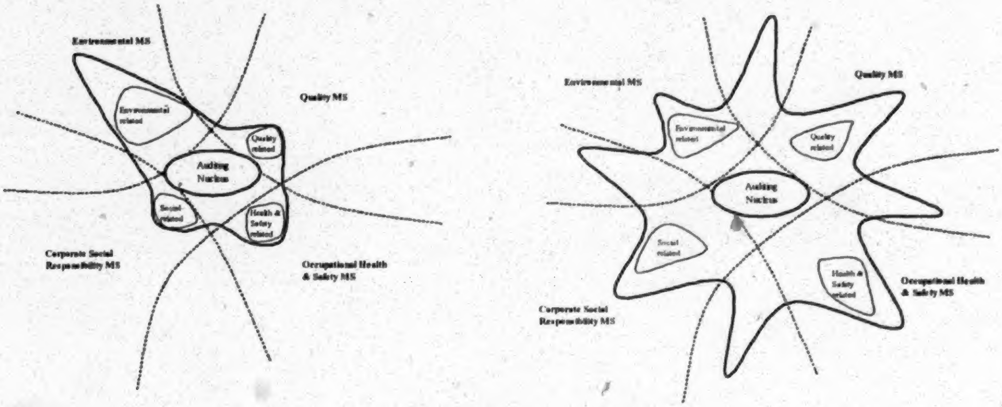

Environmental MS
Quality MS
Environmental related
Quality related
Auditing Nucleus
Social related
Health & Safety related
Corporate Social Responsibility MS
Occupational Health & Safety MS
Environmental MS
Quality MS
Environmental related
Quality related
Auditing Nucleus
Social related
Health & Safety related
Occupational Health & Safety MS
Corporate Social Responsibility MS

Figure 6-1: Auditing MSs and an IMS

6.2 Identification of International Auditing Guidelines

Nowadays, ISO 19011:2002 is the common set of guidelines for auditing an ISO 9001 QMS or an ISO 14001 EMS. As mentioned in the literature survey (See Section 2.8.5), this standard may be considered as the basis for auditing an OHSAS 18001 OHSMS. However, the selected CSRMSS, AA 1000, does have its own framework for auditing, which is fairly developed to support corporate accountability as the standard main principle. AA 1000 framework contains: requirements for principles of social and ethical nature; programmes for social auditing and assessment; procedures, techniques and methods for individual social audits; and qualifications for competence and skills of social auditors spanning over the broad range of social issues. As such, both set of requirements, ISO 19011:2002 and AA 1000, are identified as embodying current auditing practices related to the underlying MSs the IMS model was built upon.

Analysis of AA1000 using ISO 19011 as baseline		
Clause	**ISO 19011 match**	**Action**
P 10	Corresponds to 5.1 (General – Managing an audit programme). AA 1000 only considers isolated audits and not audit programme. Also, the nature of audits considered in AA1000 is of external conduction.	None
P 10.1	Corresponds to 6.5.4 (Collecting and verifying information) and 5.3.3 (Procedures)	None
P 10.2	Corresponds to 3 (Terms and definitions)	None
P 10.3	Is consistent to 6.2.1 (Appointing the audit team leader). However, AA1000 only considers external auditors, selected according to audit scope and legitimacy.	Include criteria for selection of audit team leader based on audit scope and legitimacy (6.2.1)
P 10.4	Not addressed in ISO 19011.	Include the requirement to appoint auditor from the outset of the scoping process (6.2.1)
P 10.5	Consistent to 6.6.1 (Preparing the audit report). Audit opinion (AA1000) is similar in concept to audit conclusion (ISO 19011). AA1000 also mentions explicitly that the governing body (board/top management) remains responsible for the overall audit process	Include in 5.3.1 explicit mention of responsibility of top management for the overall auditing process.

Table 6-1: Comparing AA100 auditing issues to ISO 19011

6.3 Alignment and Harmonization of Auditing Requirements

Next, ISO 19011:2002 and AA 1000, more specifically section 10 – Audit Report, are compared , looking for similarities and differences in terms of content. Given its applicability to three out of four components of the IMS model, ISO 19011 is designed the baseline for this comparison. The results revel that, generally speaking, most of the features of the social and ethical auditing scheme as described in AA 1000 are already addressed in ISO 19011. However, certain requirements are not explicitly included in the guidelines for quality and environment MS, e.g. the audit degree of confidence and the principles of sufficiency and appropriateness for audit evidence; thus making it necessary to align them and harmonize them along the ISO 19011. Table 6-1 is an extract of this analysis, which shows the first five clauses of AA1000 section 10, their degree of compatibility with ISO 19011 requirements and required actions to take based on the "all-encompassing" approach, used in drafting the IMS guidelines. For instance, Clause P.10 can be totally encompassed by section 5.1 of ISO 19011-5.1, thus requiring no action whatsoever. However, section P.10.4 of AA1000 is not addressed in any of ISO 19011 requirements leading to incorporate "appointment of auditor from the outset of the scoping process" as part of the requirement 6.2.1 of ISO 19011. This same process is repeated for all 21 remaining requirements (See Appendix D-1)

6.4 Creating an Auditing Proto-System (APS)

6.4.1 Enhancing Audit Quality

Both standardized set of requirements analyzed in the previous section are the result of international consensus, which allows to have a common platform for understanding and applying audit procedures regardless of geographical limitations. However, as it was previously observed in Section 2.8.5.3 of the literature survey, the need to update the audit requirements to include new and proved approaches from the financial audits as well as best practices gathered from accumulated experience in auditing MSs have been raised. No claim is made that the identified areas for improvement and their required modifications would facilitate to surmount all potential auditing weaknesses but rather, to improve the overall performance of the auditing elements beyond the performance achieved by standardized auditing requirements. To be systematic, these areas for improvement are conveniently categorized in four categories, following the current structure of ISO 19011: auditing principles, audit programme, audit procedure and auditor's competence.

Description of Identified Shortcoming	Source	ISO 19011 Clause	Best Practice	
			External audits	Internal audits
AUDITING PRINCIPLES RELATED				
Lack of emphasis on independence as THE principle for auditing and auditor (auditors should not audit their own work)	Johnson (2004)	4 & 5.6	For external audits, the organization should use the services of auditing firms other than those involved in consulting and improving such processes	For internal auditing, independence is asserted by including auditors from outside the area of audit
Auditors deliver other services to the organization, in the same or similar processes	Wooten (2003)			
Auditors have actual or potential monetary benefit, thus losing independence and credibility of audit process.	Johnstone et al (2001)	4 & 5.6	Independence is strengthened and exercised through corporate governance mechanisms, auditing firm policies, regulatory oversight, auditing firm culture and individual auditors characteristics	Independence is strengthened and exercised through corporate governance mechanisms, auditing firm policies, regulatory oversight, auditing firm culture and individual auditors characteristics
Auditors have personal, familiar or professional relationships with the client or area to audit. Nonconformancies can be no reported for fear of losing audit fees	Wooten (2003); Johnstone et al (2001)			
Independence can be compromised by long associations and less rigorous audit procedures	Deis and Giroux (1992)	4 & 5.3	The organization should require a frequent rotation on the members of the auditing team	For internal auditing, rotate the members of the auditing team so they audit different areas
Lost of value when auditing is not performed by someone with the knowledge of the area and operations	Karapetrovic and Willborn (2001)	4 & 5.3	External audits must have competence and experience necessary to audit thee organization's systems	When auditing for purposes other than compliance and strict verification, team up with people from the department to perform such assessment may obtain better results
MANAGING AN AUDIT PROGRAMME RELATED				
Lack of emphasis on internal and supplier audit applications	Johnson (2004)	5.2.1 & 5.1	Explicit mention in the guidelines for internal and supplier audits as part of the auditing program	
Lack of credibility in the quality of external audits. It is unclear whether the difference of the quality of audits between large and small audit firms is actual or perceived (Wooten, 2003). DeAngelo (1981) suggests larger firms perform better audits	DeAngelo (1981); Wooten (2003)	5.3	Select auditing firm with knowledge in the sector and market, and with capability according to the size and complexity of the auditee's operations	
Lack of measuring on the contribution of the auditing programme to the improvement of the overriding system, e.g. quality or environmental system	Johnson (2004), Karapetrovic and Willborn (2000); Krishnan and Shauer	5.6	Require a systematic peer-review process to the auditing firm(s) to assure effectiveness of the audit process	Add a peer review procedure as part of the auditing program for internal audits
Lack of ability to measure efficiency and drive continuous improvement (binary/attribute based)	Karapetrovic and Willborn (2001)	5.2.1	Include indicators and corresponding methods to measure the audit results in terms of strengths and weaknesses as part of the normal audit Time frame should be taken into account to determine the speed of organization performance	
Lack of effectiveness of internal auditing in determining the degree to which the auditee has evaluated the achievement of the objectives of its specific programs and activities	Dittenhofer (2001)	5.2.1		Set objectives of the internal auditing procedures to assess the level of control and measurement of objectives for the MS
Static and slow for changing conditions	Karapetrovic and Willborn (2001)	5.2.2	A flexible audit program set in tune with business strategies and general objectives, especially for those internal audits.	
Audit findings ignored or not effectively dealt with thus leaving them out of the managerial decision-making process	Beckmerhagen (2004); Bou-Raad (2000)	5.1, 5.6 & 5.2.2	Establish the sequence of audits, follow-ups and interconnections (inputs for an audit are taken from outputs of previous ones) as part of the process of the audit programme and as input for the mainstream business processes	
Lack of internal driven audits, which are usually performed only as a result of external forces, bringing resistance from the organization	van der Wiele et al (2000)	5.1 & 5.2	Management should show active commitment and remain as the last responsible of the audit program with the implementation of the audit programme and close follow up of the results.	

Table 6-2: Enhancing the quality of auditing

Description of Identified Shortcoming	Source	ISO 19011 Clause	Best Practice	
			External audits	Internal audits
AUDIT ACTIVITIES RELATED				
Considerations for the complexity of the MS, specially when used by SMEs, should be included in the audit scope definition	Johnson (2004)	6.2.2	Include a consideration in the auditing scope (using the box help format) for SMEs requiring audits less formals, more dynamics and quick actions for follow up	
Lack of guidance to perform the document and on site stages of an audit	Johnson (2004)	6.4.1	Provide more information on methods and techniques available for conducting the document and the on-site audit activities. The use of box help used in ISO 19011 is useful to this purpose. Audit risks should be clearly defined and ranked in terms of impact and frequency	
Challenge the formality of protocols when applicable to internal audits	Johnson (2004)	6.4.1		For SMEs and in a proven (from previous audits and assessments) strongly-controlled organizations, internal auditing can be done with less formal protocols when the audit objective is other than compliance
Lack of consistent use of statistical sampling techniques for gathering the information to know and increase audit suitability	Karapetrovic and Willborn (1998, 2000)	6.4.1	Include the use of sampling and statistical techniques as requirements for performing an audit. The complexity of the audit will mandate the degree of assurance required for sampling.	
Lack of considerations to follow when an individual audit is cancelled	Karapetrovic and Willborn (2000)	6.2.3	Resume cancelled audits as soon as the initial reasons of the cancellation have been overcome. In case this is deemed as unfeasible, the team leader should inform of this to all stakeholders along with the measures for future auditing. To resume an unfeasible audit is considered as an audit follow-up	
Lack of considerations for managing audit risk assessment (error type I - accepting a wrong finding; error type II - rejecting a correct one)	Karapetrovic and Willborn (1998, 2000)	6.5.5	Estimate the possibility of occurrence of each error for those audits that because of their scope and extent would be required. Establish maximum limits and audit using sample sizes to reduce probability below such limits. Potential techniques to diminish the risk of occurrence of this errors are the fault tree analysis and the failure mode, effect and critically analysis	
RELATED TO COMPETENCE OF AUDITORS				
Lack of mention competencies for auditors that perform internal audits	Johnson (2004)	7.4.1	Differentiate competencies for those internal and external auditors (same competencies, but different levels for each one)	
Lack of emphasis for updating on information systems technology	Karapetrovic and Willborn (2000), Wooten	7.4.1	Include strong considerations for auditors to maintain and update their knowledge and skills in information technology, e.g. databases, e mails, e commerce.	
Requirements for auditors too burdensome (for developing countries)	Johnson (2004)	7	None	
Requirements for auditors too loose (for developed countries)	Johnson (2004)	7	None	

Table 6-2: Continued

Table 6-2 illustrates the findings. Each area of improvement is deployed in the corresponding section along with its source (author / date). Next, the particular ISO 19011 requirement(s) with bigger impact is identified, thus matching each area of improvement to a particular audit element(s). The table also illustrates possible additions or modifications to the requirements as described in ISO 19011, specifying its applicability to either internal or external audits. Recognizing this difference is important for management purposes, since audit resources are usually scarcer for an internal audit and audit objectives can also be different, which may cause that the principle of independence would be carried out differently. When possible, the suggested modifications are based on empirical research. However, in some cases, no empirical information could be found and a sound conceptual proposal was chosen instead. The table is illustrative in nature rather than comprehensive aiming to provide robustness and reduction of risk of potential flaws in the auditing process.

6.4.1.1 Auditing principles

Among the audit principles, "independence of auditor" and "due professional care" principles stand by themselves. Finding a competent and skilled auditor, independent to the audited area (internal auditors) or to the company (external audit) may be difficult and expensive, since competence and experience usually come from involvement in organization's particular operations. To find some balance between the two principles, it is suggested to foster independence of auditors for all external audits and compliance-driven for internal audits. Peer review process, rotation of auditors and enhancement of the ethical values of the auditors and top management are requirements that can reduce significantly the risk of having lack of independence in the processes of detection and reporting of non-conformances.

6.4.1.2 Managing Auditing

When managing an audit programme, a total of eight potential risks were identified as the most relevant, arranged into three main categories: emphasis on internal and supplier audits, the effectiveness for helping and improving the audited management system, and the effectiveness of the auditing programme and the audit procedures themselves. "Best audit practices" are added as requirements for mitigating those risks (See second section Table 6-2). For instance, for the first category explicitly requiring both internal and external (included supplier-related) audits is suggested. For the second category, those suggestions are: providing flexibility to the development and planning of objectives of the individual audits which reflect the needs of the system and the organization, establishing the sequence of audits and consequent follow-ups along to their relationship with the management system and the overall organization; and including indicators and corresponding methods to measure the audit results in terms of strengths and weaknesses of the audited management system as part of the normal audit findings. And for the third category it is suggested to include a systematic peer-review process of the auditing team, to feed audit findings as input into the business strategies, and to perform an actual audit for the auditing process itself.

6.4.1.3 Individual Audit Procedures

A number of risks associated to the procedure followed for individual audits were also identified. These issues, six in total, can be grouped in two main categories: those addressing the level of formality and complexity of an audit and those based on a perceived lack of techniques and methods to minimize errors. For the former mitigating measures suggested are: a more streamlined and less formal procedure probably based on the same "box help" format used in ISO 19011 and the option to diminish the level of formality in several protocols, such as the opening meeting and the reporting process. For the latter category, remedial actions proposed are: inclusion of risk treatment, sampling and statistical techniques and resumption of and accountability for cancelled audits.

6.4.1.4 Auditors' Competence

The competence and qualifications of an auditor are relevant and duly noted in the writing of ISO 19011, where the entire section 7 is devoted to these issues. However, particular needs for internal auditors are not described in the guidelines, which appear to consider only requirements for external auditors. It is suggested to describe internal auditor requirements that considered their scarcity, knowledge on audited processes and the degree of dependence their normal activities have with the audited process.

6.4.2 Consolidation of the Auditing Proto-System

A consolidation of auditing requirements is necessary to include elements from ISO 19011:2002; AA 1000 and identified "best practices". The output of this consolidation is the "Auditing Proto-System (APS), which is a harmonized set of combined requirements for auditing four standardized MSs, i.e. QMS –EMS – OHSMS – CSRMS, enhanced by additional requirements, i.e. best practices, looking for overall improvement of the quality audit. These requirements are deployed into a four-sectioned structure, which is based on ISO 19011, thus having similar headlines: Auditing Principles, Management of Auditing System, Conduction of Audits, and Competence and Evaluation of Auditors. To harmonize the already aligned set of auditing requirements the "all-encompassing" approach is again applied.

Auditing requirements are harmonized following the same methodology used for the IMS model. For instance, harmonizing the "auditing principles" was done based on the two set of principles depicted in ISO 19011:2002: auditor related and auditing process related. Principles for auditor, initially containing ethical conduct, fair presentation and due professional care are left the same to be applicable for auditing OHS and CSR processes. However, principles guiding the auditing process, initially considering "independence" and "evidence" are enhanced by accommodating two principles from AA1000, "sufficiency" and appropriateness". By including these two principles, a more thorough treatment is expected when performing an audit, measuring the extent (sufficiency) and the nature and timing (Appropriateness) of the audit procedures so the "evidence" principle is achieved when reaching audit conclusion. Finally, to increase the quality of the overall auditing process the principle of "independence" is modified to accommodate the needs for having skilled auditors at all times even when resources are scarce, identified in Table 6-2, to follow the "due professional care" principle. Table 6-3 presents the final result for auditing principles as described in the APS. The same process is repeated through the four sections to have the APS outlined (See Appendix D-2).

4	**Principles of auditing**
	The basis for the impartiality and objectivity of the audit conclusions Auditors are independent of the activity being audited and are free from bias and conflict of interest. Auditors maintain an objective state of mind throughout the audit process to ensure that the findings and conclusions will be based only on the evidenc
BP	**The basis for the impartiality and objectivity of the audit conclusions**
	Auditors maintain an objective state of mind throughout the audit process to ensure that the findings and conclusions will be based only on the evidence. Independence of auditors is balanced with the principle of due professional care. Auditors are indepe
CSR	Include "Sufficiency" as an audit principle
	The measure of the quantity of the audit evidence and refers to the extent to the audit procedures performed.
CSR	Include "Appropriateness" as an audit principle
	The measure of quality or reliability of audit evidence and refers to the nature and timing of the audit procedures performed and the accounting, auditing and reporting process.

Table 6-3: Consolidation of "Audit Principles" into the APS

Once the APS is properly populated with specific auditing requirements, its integration to the context of the IMS model is the next step.

6.5 Auditing an Integrated System

The systems approach used for the whole IMS proposal demands that every element should be addressed as part of such a higher system. To complete the integration of auditing, the APS should undergo through a final analysis to emerge as a fully integrated component of the IMS.

Although this systems approach embedded into the IMS model is expected to bring a better understanding of organization's operations, its very same integrative nature will also have an impact on the traditional auditing approach. For instance, auditing, usually considered and practiced as a contrasting, static, assessment activity of an organization's system against a particular set of criteria (Willborn, 1986), would have to change to a more dynamic and proactive role as part of the IMS that is able to also facilitate employee training, knowledge sharing and process performance improvement.

Although not much research has been done on this topic, some conceptual alternatives for incorporating auditing as part of the IMS puzzle have been presented. Beckmerhagen et al (2002) and Karapetrovic (2002) have suggested three possible ways to integrate the requirements for auditing as an augmenting subsystem of an IMS:

a) Core Universal Audit Guidelines (UAG)
b) Aligned UAG
c) Roadmap UAG

In Table 6-4 is discussed the advantages and disadvantages that every integrating approach offers. For instance, the "core" approach, a simpler version of the "aligned" approach, clearly mentions a tentative list of elements that should be considered as part of the "common core" whilst the remaining elements are aligned fitting in the same and shared format. The third approach, supporting the creation of a "roadmap" for integration of auditing, would be considered as a complement for implementing any of the two first approaches.

Approaches	Advantages	Disadvantages
Core UAG A common core formed by common elements of the existing guidelines. The remaining auditing elements, e.g. quality and environmental audits, would be used as they currently are in each of the particular guidelines.	• It is flexible to consider different models for auditing • It builds strong body of knowledge for those common elements along the organization • Avoid internals conflicts between functional areas since the discipline-related elements are left "as-is"	• Lack of mention which elements should be denominated as "common" • Lack of synergy to take advantage of the best practices and approaches for similar auditing aspects • The extent to which common elements are considered is left open. • Not mention is made about links and interactions with targeted MSs
Aligned UAG With a common core previously integrated (definitions, principles, objectives, processes and resources) and function specific modules. These modules would have identical format but each of them addressing particular discipline-related issues.	• It is flexible to consider different models for auditing • It does mention which elements should be integrated. • It builds strong body of knowledge for those common elements along the organization	• Lack of synergy to take advantage of the best practices and approaches for similar auditing aspects • The extent to which common elements are integrated is not mentioned. • It will require skilled auditors and customized infrastructure for auditing • Not mention is made about links and interactions with targeted MS
Roadmap UAG This is a methodology for alignment and integration of internal audits.	• It is a complement for any of the two previous approaches • Provides to organization with a general view for how-to when integrating audits • Internal audits are enhanced to have a relevant role in IMS implementation	• It does not mention what to integrate • Only considers internal audits • Not mention is made about links and interactions with targeted management system and organization's overall management system

Table 6-4: Approaches for integrating auditing requirements

As it is illustrated in the table, the "aligned" and "core" approaches, although offering some solid points towards the integration process, would result in another stand-alone system with a weak connection to the overriding business management system, which is clearly an undesirable situation. This isolation would bring the same set of problems identified at the beginning of this research, but now focused in the auditing system rather than particular management systems. However, once it is concluded that any of this proposals would produce an isolated system, the solution seems to be clear. Therefore, a fourth proposal is elaborated to integrate the auditing guidelines among them and, more importantly, to a superseding management system, i.e. the IMS.

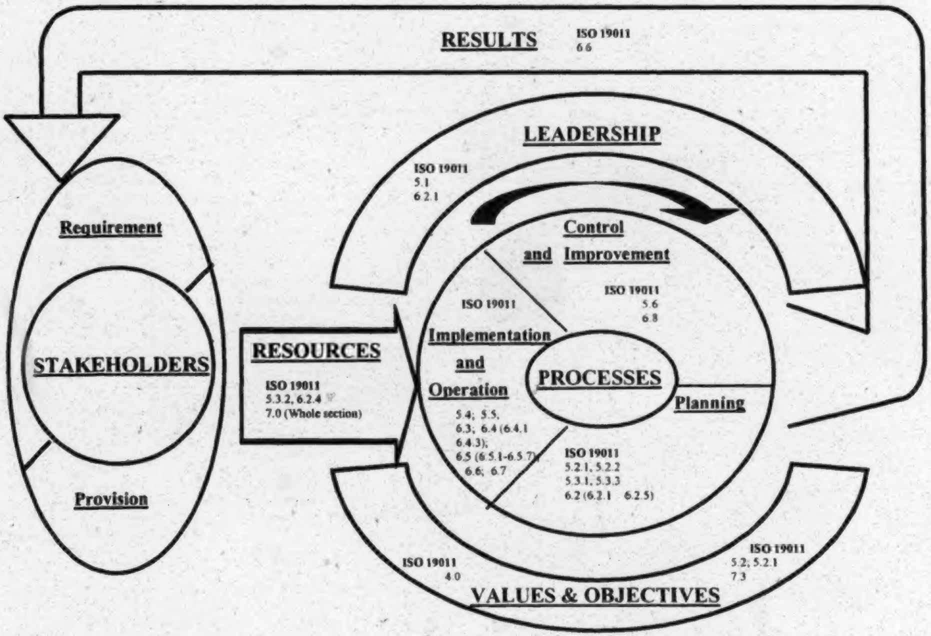

RESULTS
ISO 19011 6.6
LEADERSHIP
ISO 19011 5.1 6.2.1
Control and Improvement
ISO 19011 5.6 6.8
Requirement
STAKEHOLDERS
Provision
RESOURCES
ISO 19011 5.3.2, 6.2.4 7.0 (Whole section)
ISO 19011
Implementation and Operation
5.4; 5.5, 6.3; 6.4 (6.4.1 6.4.3); 6.5 (6.5.1-6.5.7); 6.6; 6.7
PROCESSES
Planning
ISO 19011 5.2.1, 5.2.2 5.3.1, 5.3.3 6.2 (6.2.1 6.2.5)
ISO 19011 4.0
ISO 19011 5.2; 5.2.1 7.3
VALUES & OBJECTIVES

Figure 6-2: Deployment of auditing elements into the IMS model

A fourth alternative is proposed here: auditing as a system, subservient to the IMS. This option consists of deploying the set of auditing requirements into the seven-element structure underlying the IMS model (See Figure 5-4). A number of gaps are expected to appear given the more thorough analysis for system requirements of the IMS model compared to the APS. For instance, for auditing resources (Section 5.0 IMS) addressed in the APS only human resources are considered, i.e. APS 7.0 – Competence of auditors. No mention is done regarding infrastructure, equipment and information. All these identified gaps need to be fill out to have a fully-fledged auditing management system.

Three alternatives have been identified to define those missing requirements:

a) **Leaving them as is**. Clearly, this option is disregarded immediately because the result would leave the auditing requirements as an isolated and crippled programme, which makes it of little value to the IMS and to the organization.

b) **New highly-tailored requirements.** These requirements would be designed literally out-of-the-blue, to use a common expression, and although the option may bring some creative insight, it would also represent investment in time and resources that seems to be unnecessary with the possibility to end up with a system unaligned to the IMS model and its different elements.

c) **Requirements along the IMS content**. Using the IMS guidelines as blueprint for the missing requirements with some minor modification to adapt them to the particular conditions of auditing process.

The third option is selected due to its potential contribution towards a truly assimilation and interconnection of the auditing system with the IMS.

6.6 Drafting the Guidelines for an Auditing Management System

The final IMS Auditing System is finally drafted using the requirements from the APS and filling out the missing elements as set in the IMS model. These missing elements will be the shared elements along the IMS that, in the end, will facilitate the required encouragement for integration. For instance, a key area of auditing that benefit from such integration is auditing resources by sharing the pool of resources the IMS has access to and including them when planning, allocating and deploying IMS resources into the processes. This area is described below to illustrate the method followed to define such definition of a comprehensive set of auditing resources.

To define requirements for auditing resources, section 7.0 of the APS – "Competence of auditors" is deployed into the different requirements that conforms section 5.0 of the IMS, "Resources". This section of the IMS contains requirements for "Provision of resources" (Clause 5.1), "Human resources" (Clause 5.2), "Infrastructure" (Clause 5.3) and "Information" (5.4). Since section 7.0 of the APS only describes, although rather thoroughly, the requirements for having skilled and competent auditors as well as the process for maintaining and improving their capabilities, the whole section is entirely deployed into "Human resources" (Clause 5.2 IMS). As illustrated in Table 5-5, sections 5.2.1 – Human resource management, 5.2.2 – Competence and Training, and 5.2.4 – Maintenance of human resource are fully filled out yet section 5.2.3 – involvement of personnel remains untouched. This particular requirement plus those for "Provision of auditing resources", "Infrastructure for auditing", and "Auditing information" are taken entirely from the IMS guidelines.

IMS	**APS**
Section 5.2 - Human resources.	**Section 7.0 – Auditor's competence**
5.2.1 Human resource management	7.5 Maintenance and improvement of competence 7.6 Auditor evaluation
5.2.2 Competence and training	7.2 Knowledge and skills 7.3 Personal attributes 7.4 Education, work experience, and auditor training 7.5 Maintenance and improvement of competence 7.6 Auditor evaluation
5.2.3 Involvement of personnel	
5.2.4 Maintenance of human resource	7.6 Auditor evaluation

Table 6-5: Requirements for auditors: the IMS and the APS

Each of the acknowledged missing elements is then extracted from the IMS guidelines and analyzed for appropriateness to the particular conditions and needs of an auditing process. For example, an auditing system will require certain resources for implementing a set of audits, according to the needs of the IMS and the organization overall. The provision of those resources is mentioned, yet succinctly, in Clause 5.1 – Provision of resources. The specific wording in the IMS guidelines requires no changes for auditing purposes. Therefore, clause 5.1 is fully extracted and plugged into the Auditing Management System.

Next, it is necessary to include requirements for involvement of personnel (IMS Clause 5.2.3). Auditing requires the participation of employees along the process, to perform internal audits, to show the system and its elements to the auditors and to carry on the corrective, preventive and improvement actions that emerge as a result of the auditing process. Due to the scope of the IMS, involvement of personnel in every auditing step is essential to implement, monitor and improve the system in an on-going basis, which is the reason why the entire section is included with a minor modification. The auditing system should consider the role of external experts who provide valuable insights in the examination process, especially since the extent of the IMS is very demanding requiring an ample knowledge in quality, environmental, health & safety and social responsibility issues. These experts and their participation should adhere to the IMS and organization requirements.

Besides human resources, the auditing system also requires a suitable infrastructure to support auditors, the auditing process and the information and documentation used during the audits. For instance, having facilities to hold meetings and perform analysis during the audit process; software and hardware to analyze the IMS processes and keep audit records; and miscellaneous such as transportation and accommodation are also required. Therefore, IMS section 6.3 is shared entirely with the AMS.

Complementing the auditing infrastructure, attention to the information management is required for facilitating gathering, analyzing, communicating and maintaining sufficient and relevant information from the auditing processes. Information in particular is a key element in integration so requirements in this aspect for the IMS should include auditing requirements from the beginning. The IMS model requires that the organization collects the information using different methodologies and techniques such as surveys, interviews, document reviews. Although managing information should be standardized, specific methods for gathering it for auditing purposes are required. Therefore, a minor addition to IMS section 5.4, probably under the "box help" format, is required

From this analysis, the AMS model will count with resources shared with the overarching IMS model. When applied, tradeoffs, potential conflicts of interest and possible synergy between resources already deployed for other processes are expected to be managed by this integration. The remaining six elements are populated based on this procedure until a fully-integrated and IMS-aligned Auditing System is obtained. Evidently, the final modifications would differ from element to element; some of them would need major additions while some of them are almost kept as described in the APS with some minor changes.

6.7 Summary

An Auditing Management System (AMS) model is designed in this chapter to augment the IMS model assessment abilities. Based on the seven element structure underlying the IMS model, the AMS model is populated with requirements from the standardized auditing practices that are applicable to those four MSs included in the IMS scope. These requirements are enhanced with requirements from the identified auditing "best practices" to improve the quality of the auditing system. The AMS model is susceptible of improvement to follow a similar path of the IMS implementation methodology. Auditing roles and capabilities for driving excellence are explored in the next chapter.

7. Auditing and Enhanced IMS

7.1 Introduction

An IMS is a dynamic entity, changing through time to help organizations to deal with new market conditions, new stakeholders, new requirements, and the continuous need of performing better. Within this context, the auditing component of the IMS model should inherit this dynamic approach to meet new requirements. If the auditing system remains to be used only for compliance verification purposes it is likely to become obsolete, unconnected from the IMS, and representing a waste of resources. This chapter presents a conceptual enhancement of the Auditing Management System (AMS) model, designed in the previous chapter, to facilitate the IMS implementation in each of the three methodology phases. To do so, a number of issues are discussed and included: modifications to the auditing objectives, inclusion of new roles for auditing as an IMS sub-system, and integration of AMS auditing practices with those for self-assessment and benchmarking to facilitate the implementation and enhancement of an IMS.

7.2 Auditing Roles

The IMS is implemented through three sequential phases, presented and explained in Chapter Five, each with its own milestones and auditing should play different roles to help on the consecution of each one of them. In the first phase, knowing particular management needs of the organization to define a valuable and feasible IMS is essential; auditing facilitates such definition by being employed to verify compliance of organization's management against IMS criteria. However, this rather narrow scope for auditing should be changed for the second and third phases to facilitate the integration between MSs and the improvement of the IMS respectively.

An audit is performed to satisfy a number of objectives, which can be broad in extent as mentioned in Section 6.1.4 of the AMS. Satisfying management priorities, management system requirements, supplier evaluation needs, customer requirements, regulatory requirements, market requirements are some of the objectives that an audit may be based when planning it. Within an IMS context, these and other auditing objectives can be summarized into four categories or roles:

1. **Compliance driven**. An audit may be driven to look for compliance when it is devoted to assess a system to comply with statutory, regulatory and contractual requirements; to verify a supplier; to demonstrate to a customer or to a market its compliance with an agreed standard.
2. **Improvement driven**. An audit may be used to look for improvement opportunities in their process to satisfy customers, to save resources, or to increase productivity and effectiveness of the system audited.
3. **Personnel training**. An audit may be performed to meet any of the two first roles, but also having in mind the increase of competence of internal employees in both the management system being audited and the auditing process itself.
4. **Knowledge sharing**. An audit may be performed to meet any of the three previous roles, and also have the capability of auditors and auditees to interchange best practices from one area to others, from one process to others, building what is called a learning organization.

7.3 Auditing along IMS Implementation Methodology

Each role is valuable at a given time when integrating standardized management systems. How auditing roles change over time will depend on the status of the IMS and the implementation phase in turn. For instance, the development of the first two auditing roles, compliance and improvement driven, are presented in Figure 7-1. Here, the IMS is represented for a continuous line while the auditing roles are represented for a couple of dashed lines. An IMS is being implemented at standardized level (From T_0 to T_1), consolidated (From T_1 to $T_{1'}$) and, finally, enhanced (From T_1 to T_2). During initial implementation (From T_0 to T_1), auditing serves mainly as a *compliance verifier* tool to confirm that every MSs is implemented and integrated according to the scope of the IMS, leaving *Improvement* as minor objective of the auditing system, since it is necessary first to have solid foundations over which valuable and sustaining improvements can be done more easily. However, around the end of second phase of the IMS implementation methodology (From T_1 to $T_{1'}$) auditing roles should be shifting to a more *improvement* driven focus to identify weaknesses and strengths that lead to develop initiatives to improve the IMS or specific IMS elements. In the meantime, *compliance verifier* as auditing objective is kept at minimum, appearing mostly when external stakeholders require assurance of the IMS to a specific standard(s). This ratio between *improvement* over *compliance* objectives is increased in the third phase (From T_1 and up).

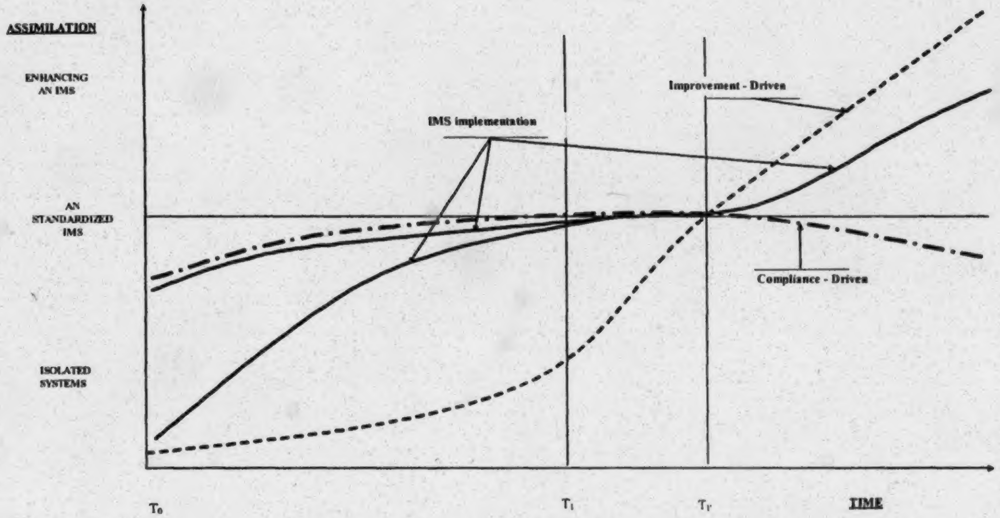


Figure 7-1: Compliance verifier – Improvement driver for an IMS

Driving compliance and improvement are the most well-known roles of auditing. Nevertheless, auditing also plays two additional roles that support the development of an IMS, subtly yet probably more importantly, impacting on the role of employees as "doers" in the implementation process. *Personnel training* and *knowledge sharing* are visualized potential roles for auditing that may contribute to prepare employees and to spread the knowledge of processes and techniques required to improve an IMS. Considering a similar IMS timeline used in the previous figure, Figure 7-2 illustrates auditing as a *personnel training* facilitator while implementing an initial IMS (From T_0 to T_1). For instance when being audited or performing an internal audit for control of documentation and records, employees see more clearly the relevance of such controls and plausible ways to be done. At this time, *Sharing of best practices* is kept at minimum since a training period is required to consolidate the basics of the system. However, after T_1 the roles for auditing virtually reverse, with major emphasis on best-practice sharing where both auditors and auditees interchange information. The best practices seen in one department, area or division are translated to those department, area or division where can be of high impact. Usually, at this stage, the assessments are performed by internal people that are genuinely interested in sharing and deploying those successful strategies

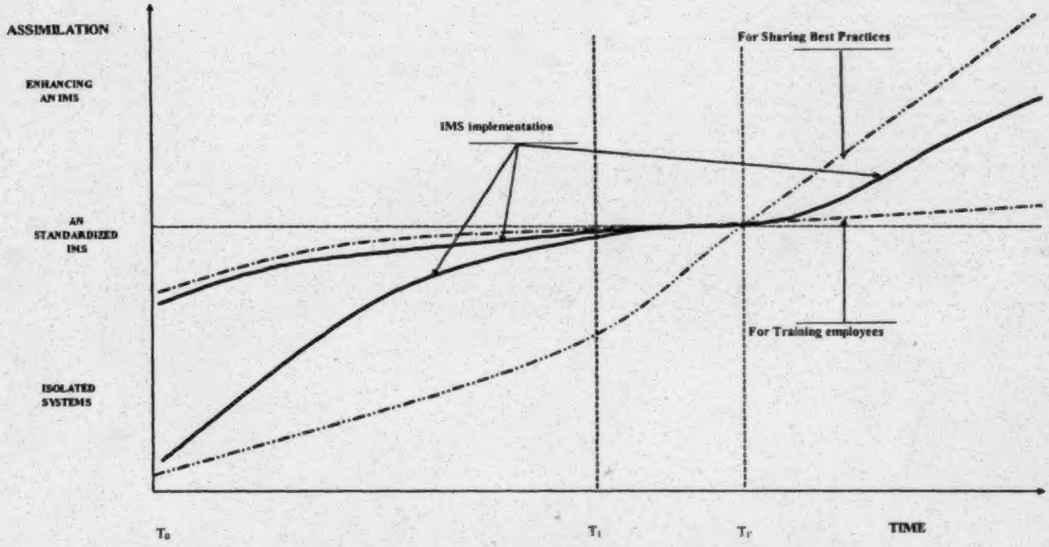


Figure 7-2: Training – Knowledge Sharing for an IMS

In Figure 7-3 is illustrated the relationship between all four roles of auditing, depicting the strong links between the two pairs, "compliance – personnel training" and "improvement – knowledge sharing".

At T_0 the organization is likely to have one or two MSs yet isolated. From this point to T_1, the organization will implement subsequent MSs and integrating them into the all-encompassing IMS framework until the full scope of the IMS is reached. A number of audits, mostly internals in nature, are also performed to assure each MS is properly implemented and assimilated into the IMS model. After a number of audits, internal auditors grasp better the mechanics of the auditing processes and auditees become more familiar with the basic elements of the IMS, their relation with specific stakeholders and with their own position and responsibilities. An audit helps to emphasize the importance of the system and their relation with specific roles and responsibility of people. For example, consider an audit developed to verify all elements of a system are in place, i.e. compliance driven, using the IMS guidelines to cover quality and environmental systems. A non-conformance is found when auditing Control of Documents (Clause 1.6 of the IMS): the organization lacks of procedures for a continuously updating of the records of environmental performance in air emissions and waste management. This non-conformance is addressed in the audit report followed by the specific corrective action(s) to be implemented as agreed by the auditee. Training can be one of the answers, if the auditee is new or has not received proper guidance. A proper procedure to keep up to date the organization's performance in terms of air emissions and waste management is developed and the auditee responsible for this process is trained, showing where the data would be collected and the records to be filled out.

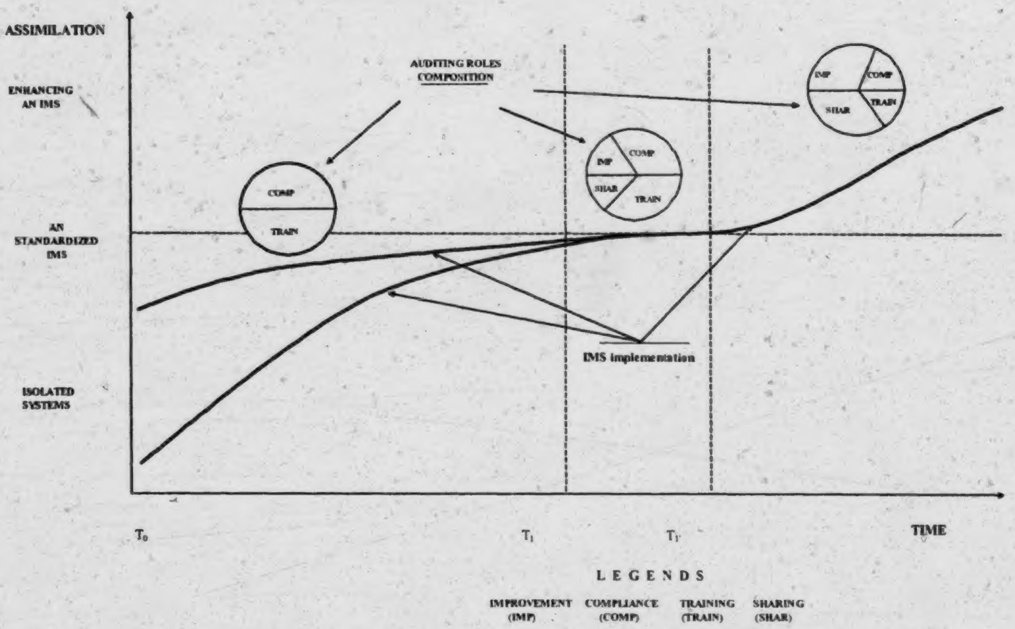

ASSIMILATION
ENHANCING AN IMS
AN STANDARDIZED IMS
ISOLATED SYSTEMS
AUDITING ROLES COMPOSITION
COMP
TRAIN
IMP
COMP
SHAR
TRAIN
IMP
COMP
SHAR
TRAIN
IMS implementation
T_0
T_1
$T_{1'}$
TIME
LEGENDS
IMPROVEMENT (IMP)
COMPLIANCE (COMP)
TRAINING (TRAIN)
SHARING (SHAR)

Figure 7-3: Auditing Role Mix during the implementation process

Later, the consolidation of the IMS, between T_1 and $T_{1'}$, sees the change in pace for auditing gearing from *compliance-training* to a more balanced mix that include *improvement-sharing* roles, although still driven by compliance and training purposes. However, after $T_{1'}$ auditing would be used mostly for improvement, through finding those opportunities in the system where changes can bring value to the organization and stakeholders alike, sharing and deploying such successful strategies into different areas and processes. For example, an organization may find during an assessment exercise that, even though the requirements set for information (Clause 5.4 of the IMS) are met, the current information system, based on computerized databases shared through intranet servers, is not fully utilized. The information system has features and capabilities to work with suppliers and clients to get information on inventories and production in progress in real time. A clear opportunity is presented here to improve the supplier chain, which goes beyond of the normal IMS threshold. From this experience, top management can search for those capabilities not being used in the organization's information system(s) that can increase the efficiency or effectiveness of specific process, i.e. communication in real time with customers directly feed to the operative areas or historical records to make statistical analysis of quality or environmental performance.

In summary, improvement of processes and sharing of knowledge and new practices are suitable and valuable auditing objectives. However, in spite of the enhanced auditing requirements done in the previous chapter, the AMS, as described in Appendix D-3, is yet not fully prepared to carry on such activities efficiently. To meet its potential, the AMS needs to be augmented and ascended, by including other assessment techniques that will balance result assessment results with the already implemented process assessment.

7.4 Auditing Evolution

To remain useful to an organization, a system should evolve and it may follow any of these alternatives, previously explained when designing an IMS (Section 4.3):

a) assimilated by higher level systems
b) ascended to satisfy in better way specific stakeholders or
c) augmented by adding specific programs or subsystems that enhance specific parts of the system.

This three-dimensional framework, used before to show the rationale behind the IMS, is also useful to illustrate how auditing can be enhanced in all three directions. Figure 7-4 depicts the evolution of the AMS to assist the IMS in the initial implementation and subsequent enhancement:

a) Along the assimilation axis, ISO 19011 and AA1000 criteria for auditing are melted to increase the audit system with sufficient elements to assess an IMS built over four MSs.
b) Along the ascension axis, the regular approach for auditing is enhanced by including first best practices, increasing the quality of audits and later provide better results to satisfy the stakeholders targeted in auditing, i.e. top management when adding self-assessment methodologies

c) Along augmentation axis, auditing is improved by adding self-assessment techniques, heavily focused on continuous improvement, and benchmarking approach, centred in assessing and deploying best practices of specific product/process.

Two assessment techniques are identified to help the AMS to evolve along with the IMS: Self-assessment and Benchmarking. Both methodologies are in fact considered in the three-phased methodology for implementation and more specifically, in the third phase – Enhancing the IMS. Second and third stages of this phase focus on self-assessment cycles and benchmarking respectively (See Figure 4-3). Both assessment approaches would enhance the IMS performance reaching levels of satisfaction close to excellence. Self-assessment focuses in improving the system in a holistic manner while benchmarking deals mostly with specific process or products to bring best practices as realized in best-in-class organizations.

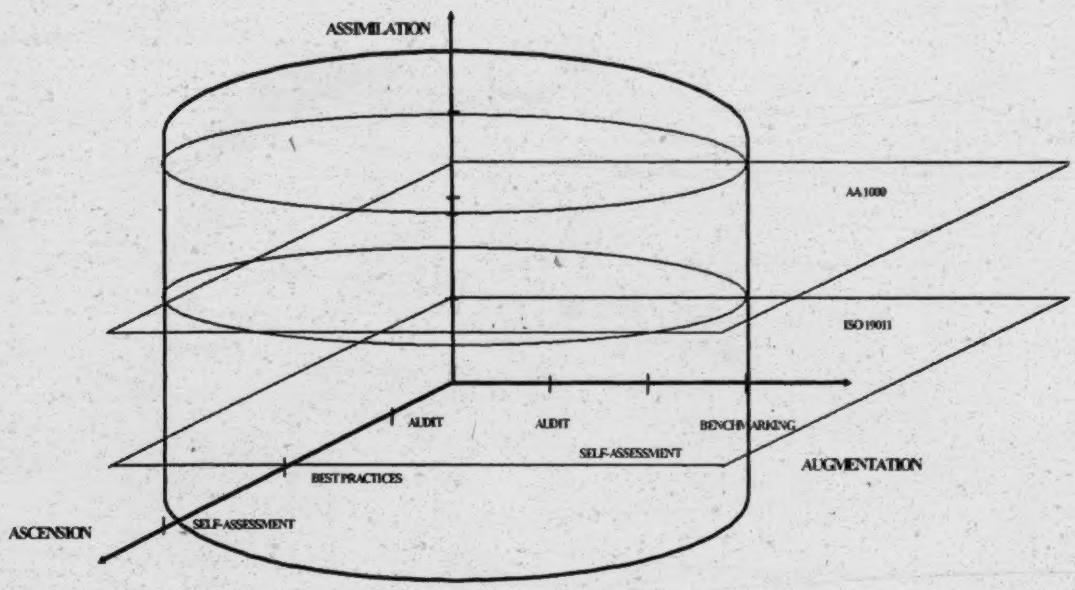

ASSIMILATION
AA 1000
ISO 19011
AUDIT
AUDIT
BENCHMARKING
SELF-ASSESSMENT
AUGMENTATION
BEST PRACTICES
ASCENSION
SELF-ASSESSMENT

Figure 7-4: Evolution of auditing

The AMS, as developed in Chapter Six, is capable to provide an adequate conceptual framework to augment and ascend the assessment capabilities of the IMS. The evolution will impact in specific elements such as the process, objectives and resources but the main structure will remain the same, giving consistency to the whole IMS model. To outline such evolution, preferably linked to the IMS roadmap, all three assessment approaches need to be compared to find how each approach addresses different requirements in terms of resources, objectives and processes.

7.5 Analysing Assessment Techniques

An extensive analysis of auditing, self-assessment and benchmarking is done, comparing them along 15 different characteristics that provide sufficient information to visualize the similarities and differences among them (See Table 7-1). This examination includes basic aspects such as objectives, principles, criteria, area of applicability, resources, report, follow-up actions, and basic sequence or process. All of them reflect a generic approach for assessment, but in a final section, specific characteristics measure the suitability of each approach to the IMS model and to the implementing methodology.

The results confirms using a traditional approach for auditing would be appropriate to implement an initial IMS, performing at standardized requirements, while self-assessment cycles and benchmarking process would be provide better results to improve the IMS performance by incorporating employee's participation and best-in-class practices. For example, self-assessment is more suited to assess an entire IMS, in an ongoing basis than auditing, usually applied to specific MSs and focused only to processes. As a consequence self-assessment is a good assessment choice during the third phase of the methodology, which is heavily focused in results, since processes are put in place and controlled in the first and second phase. Assessing results and the efficiency of the system is a task where self-assessment is better equipped than auditing. Furthermore, benchmarking may also help by searching the performance of best-in-class organizations, usually competitors, to show how the organization is performing against them. Looking at Table 7-1 it is evident that auditing, self-assessment and benchmarking are not exclusive but rather complementary (Kyro, 2003).

7.6 Integrating Self-Assessment and Benchmarking into the AMS

In general, auditing provides a solid foundation for the evolutionary process of management system assessment. Over such basis, self-assessment and benchmarking requirements would be integrated to improve the IMS assessment abilities.

Self-assessment requirements would be built from the experience and competence of internal auditors, seasoned through the implementation process, and enhancing them further to consider not only system compliance as the target of assessment but also the level of maturity of such process and the impact on the IMS and organization results. Internal auditors are the main resource from which the self-assessment process is nourished, making some modifications to expand their competence on issues such as the assessment of the elements in a variable type rather than a simple binary form.

The third approach, benchmarking, may be independent from the status of the IMS implementation. However, it is suggested to be performed mostly once the IMS is installed, so that the results coming from self-assessment would help to identify areas where benchmarking would be most valuable. In general, benchmarking needs information about the performance of the organization in the specific product or process which is investigating. This information would be also produced through the self-assessment process making unnecessary to use resources to gather such information from another method. All this sequence is illustrated in Figure 7-5, where all three assessment techniques are shown in two dimensions: scope of assessment (process oriented or result oriented) and organizational scope (internal or external).

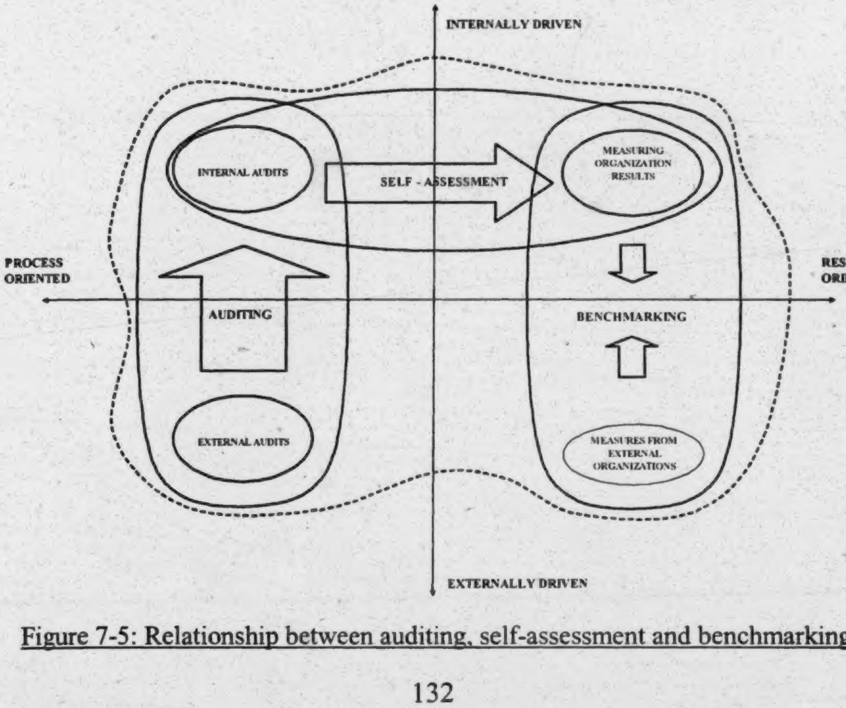

INTERNALLY DRIVEN
INTERNAL AUDITS
SELF - ASSESSMENT
MEASURING ORGANIZATION RESULTS
PROCESS ORIENTED
RESULTS ORIENTED
AUDITING
BENCHMARKING
EXTERNAL AUDITS
MEASURES FROM EXTERNAL ORGANIZATIONS
EXTERNALLY DRIVEN

Figure 7-5: Relationship between auditing, self-assessment and benchmarking

Once connections between the three assessment alternatives are found in the analysis shown in Table 7-1, the AMS will include requirements from self-assessment and benchmarking to have the ability of all three techniques combined and ready to meet the IMS needs.

This integration of assessment techniques keeps the same seven-element configuration of the IMS and the AMS. To change the only-auditing approach of the AMS for a more holistic approach of self-assessment or a more performance-specific of benchmarking process, each of the seven elements are analyzed and when necessary, modifications in particular requirements are done (See Table 7-1). For example, "Leadership" for auditing is less demanding than "Leadership" for self-assessment and more than benchmarking. Self-assessment requires a more intensive use of internal resources and a more open climate for assessment and reporting activities than auditing. To create such environment, top management should exercise its leadership by changing objectives of the auditing and committing themselves to implement required action plans resulting from self-assessment activities. On the other hand, benchmarking requirements for "leadership" are the least demanding of all three techniques since it is very area-specific and only a few resources are involved, usually through the participation of third parties. Therefore, "leadership" requirements set in the AMS work adequately to conduct benchmarking activities.

From the same analysis, it is apparent that objectives, resources and processes are the AMS elements where major modifications are necessary to include self-assessment and benchmarking requirements. For example, the objectives set for auditing change, as illustrated in the previous section, from strongly based on compliance to a major shift towards improvement-driven opportunities that are the main objective for both self-assessment and benchmarking. Auditing objectives are defined usually in terms of external forces such as customer, market or regulatory requirements while for self-assessment, the objectives come from top management and internal forces that are interested in obtaining more value for the resources invested in the organization. Benchmarking objectives are usually tied up to the business strategies and, when implemented, also to those set for self-assessment cycles. For further detail, Table 7-1 shows how each IMS element works for auditing, self-assessment and benchmarking.

IMS ELEMENT	TRADITIONAL AUDITING ⇨	SELF-ASSESSMENT ⇔	BENCHMARKING
LEADERSHIP	A top management representative of the auditing system Linked to the leadership subsystem found in the IMS	Build on commitment top management has put into the IMS Change scope and extent of assessment activities for internal purposes	Same (either for auditing or self-assessment)
VALUES	Application and monitoring of audit principles (fair presentation, due professional care, independence, evidence, ethics, sufficiency and appropriateness) Superseded by IMS principles	Enhance the continuous improvement principle as well as the learning and involvement of employees at all levels (horizontal and vertical)	Continuous improvement Sharing of best practices
OBJECTIVES	Objectives set in auditing programme, setting scope and type of audits to perform Extent of the set of audits defined	Objectives are directed towards measuring maturity levels, efficiency, effectiveness and how to improve the overall IMS By definition, all the self-assessment cycles are performed by internal assessors. Extent of the assessment defined, including an initial overall assessment	Identification of best practices in specific area They can be performed internally or externally
STAKEHOLDERS	Top management as primary stakeholder Customer, employees, environment and so on are secondary stakeholders of auditing process	Same Same	Top management and areas specifically related to process and products being benchmarked Specific stakeholders according to the objective of benchmarking
RESOURCES	Competence of auditors in Auditing techniques MSs issues Personal attributes	Competence of internal assessors in Self-Assessment techniques Methods of measurement and scoring of system elements (see EFQM approaches) Holistic approach as assessor main feature Major involvement and workload of internal assessors in self-assessment of activities and sharing of best practices	Competence of personnel in Benchmarking techniques Methods for gathering external information from best-in-class organizations Strong connections with industry and commercial associations May require a robust participation of consultants and external expertise

Table 7-1: Including self-assessment and benchmarking into the AMS

IMS ELEMENT	TRADITIONAL AUDITING ⇨	SELF-ASSESSMENT ⇔	BENCHMARKING
PROCESSES	Standard procedure for auditing which can be summed up in	Upgrading to standard procedure for self-assessment	Linking the benchmarking process to overall objectives and business plan
	Planning	**Planning**	**Planning**
	Planning objectives and feasibility of audit	Develop commitment to SA	Identify need in specific product/process
	Assigning team leader, team members and exp	Plan SA	Establish team
		Establish team to perform SA	Define indicators and scope
	Implementing and Operating	**Implementing and Operating**	**Implementing and Operating**
	Documentation audit	Communicate SA plans	Conduct internal and external assessment
	Conducting on-site audit	Conduct SA	Define differences against best practices
	Audit findings and audit conclusions		
	Completing the audit		
	releasing audit report	Establish Action plan	Establish action plan
	Conducting audit follow-up	Implement Action plan	Implement Action plan
	Controlling and improving	**Controlling and improving**	**Controlling and improving**
	Monitoring and reviewing audit procedure Conducting preventive, corrective and improving actions in the audit cycle	Review progress Conducting preventive, corrective and improving actions in the audit cycle	Review progress
RESULTS	Indicators of quality, effectiveness and efficiency of audits	Indicators of quality, effectiveness and efficiency of self-assessment cycles	Indicators of quality, effectiveness and efficiency of benchmarking process

Table 7-1: Continued

7.7 Assessment Roles for Implementing an IMS

The AMS model, enhanced with the addition of benchmarking and self-assessment requirements as described in Table 7-2, is then ready to be implemented along with the IMS. This enhancement should provide to an organization with a strong and useful tool to implement, control and improve an IMS, along the three visualized phases.

- **In the first phase**, where the IMS is designed according to the particular circumstances and business strategies of an organization, will count with an incipient AMS for the performing of the initial review. At this time, this assessment tool is mainly focused to verify compliance of the organization's management structure to the IMS requirements. As a result, a report is expected outlining the existing gaps between the organization and the IMS model together with the strengths and weaknesses in terms of resources and processes. The report should also contain a risk assessment section on regulatory, contractual and commercial regulations and requirements which will be used to establish priorities for the IMS, setting the sequence of integration as well as the scope.

- Next, for the **second phase**, the AMS should change its focus to more demanding objectives. Armed with self-assessment and best-practice enhancements, the auditing sub-system will verify the progress and completeness of the system in each cycle until the IMS is fully implemented. As part of the learning curve principle, argued to be one of the advantages of the proposed implementing methodology, the successive audits will help in training employees to not only audit-related issues but to IMS-related principles and elements. Employee engagement and built of awareness in IMS importance are also benefits achieved through this phase, specifically at the end, when feedback loops should be completed.

- Finally, the **third phase** triggers a complete upgrading of the AMS with self-assessment and benchmarking techniques. By promoting an active participation of employees into partial or system-wide assessment activities, the organization will end up with trained people who will look for opportunities for improvement once the IMS is stable and working. Specific areas are also assessed and the results compared with external data from best-in-class to visualize ways to improve those processes. Continual improvement is the bottom line objective of such efforts. For further detail in the objectives and roles of auditing along IMS implementation see Table 7-2.

7.8 Summary

In this chapter, the Auditing Management System (AMS) model developed in Chapter Six is enhanced to augment and ascend the IMS assessment abilities beyond the normal auditing approach. This enhancement embraces four potential assessment roles: compliance checker, improvement driver, personnel training and knowledge sharing. To meet these new roles, the AMS model is enhanced by integrating self-assessment and benchmarking requirements.

METHODOLOGY		AUDITING ROLE
First Phase Designing an IMS	a)	Performing the initial gap analysis against the IMS model to obtain evidence to make decisions for scope of the IMS and sequence of integration
	b)	Knowing the capability of the organization in terms of resources and infrastructure for implanting an IMS with a pre-defined scope
	c)	Knowing if the company is at risk, especially for those regulatory and contractual requirements that are considered as minimum standards to stay in the game.
	d)	Start the training and awareness of core people that will be taking part in the IMS as internal auditors.
	e)	Consulting, motivating, learning and improvising (Beckmerhagen et al, 2003)
Second Phase Implementing an Standardized IMS	a)	Verifying completeness of the "n" systems in the IMS framework
	b)	Verifying integration and deployment of elements into the organization structure
	c)	Training internal auditors in basic competencies of auditing of MSs
	d)	Training employees in auditing principles and procedures
	e)	Communicating the importance of the IMS
	f)	Training employees in the essentials of the implementation and operation of the IMS as well as their particular role, contribution and benefit.
	g)	Finding opportunities for improvement when implementing following MSs
	h)	Compliance audits are the rule, self assessment feasible (Beckmerhagen, et al, 2003)
Third Phase Enhancing the IMS with business excellence principles	a)	To drive continual improvement and deployment of learning lessons to the organization. All based on facts and objective evidence.
	b)	Training of employees in self – assessment principles
	c)	Assessing the organization's status against a selected Business Excellence Model (BEM)
	d)	Identify necessary improvement of the IMS in all its parts

Table 7-2: The roles of auditing through the IMS implementation

8 From QMS to an IMS

8.1 Introduction

In the last four chapters an IMS conceptual framework has been developed containing the IMS model, the IMS implementation methodology and the AMS model. According to the Research Methodology presented in Chapter Three a validation of this conceptual framework is next. This validation tests the flexibility of the framework to address different starting points, sequences of integration and finishing points (See research methodology Section 3.4). To do this validation, this chapter presents a simulated implementation of an IMS, based on information that describes existing internal and external conditions of a Canadian company, called Case Company "A" (CCA) to protect its privacy. From CCA current ISO 9001 registration, a simulated IMS is designed and implemented to satisfy not only quality requirements but also environmental requirements. This simulation follows the procedures provided in the IMS implementation methodology and the AMS model. In the end, CCA will be upgraded from an ISO 9001 registered company to an IMS structured company that may also apply for ISO 14001 registration.

The general procedure followed to gather data and to implement the IMS has been described in Chapter Three – Research Methodology.

8.2 The Case Company "A" (CCA)

Founded in 1995, CCA, a fictional name for a real company, is a semiconductor manufacturer based in Eastern Canada. The company decided to implement a QMS following ISO 9001: 2000 as a strategy to face more competitive market demands, especially those of its key customers. CCA's primary activity is to design semiconductor components for interconnectivity of control systems, outsourcing the manufacturing process to other companies while keeping the responsibility to the client for the final product. The company has achieved ISO 9001:2000 registration in March 2005. Further information on CCA's background can be found in Table 8-1.

This company has a number of particularities that makes it an interesting case for integration of Standardized Management Systems. First, by being a Research and

Development-focused company, CCA will exemplify how a QMS can be applied to a creative organization where partnerships are common, processes are fuzzy, and product development cycles are usually long. Second, the impact that having outsourced processes has over CCA's management systems. CCA is mainly dedicated to designing, developing and selling integrated circuits for system connectivity, leaving the actual production process for a vendor to perform them. Nonetheless, CCA is contractually responsible for those products. Having main production processes outsourced needs to be properly considered within the QMS and therefore also in the IMS. Also, environmental issues should be included into the design and development processes even when the manufacturing process is done elsewhere. These particularities are addressed in this research.

Company's name	Case Company "A"
Headquarters location	Eastern Canada
Sector	Semiconductors
Type	Research and development of System Interconnect Hardware. Manufacturing is outsourced to partners in Asia.
Size	Midsize with about 200 employees
Ownership	Publicly-held
Products	Systems for interconnectivity for storage networking, wireless infrastructure, network access, military technology, and industrial automation. The basic presentation are in the common called "chips"
Main market features	• Highly evolving • Susceptible of changes of technology • Globally competitive • Commercial and Creative Partnership are desirable
Community features	• Multicultural based • Highly regulated (provincially and federally) • Social responsible • Environmental responsible • Highly educated
QMS status	Newly implemented (May 2005)
EMS status	None
OHSMS status	Old policy. Not implemented
CSRMS status	A corporate giving program (donation)

Table 8-1: CCA's Profile

8.3 Implementing an IMS in CCA

The case is developed following the IMS Guidelines for implementation developed in Chapter 4. The information gathered from CCA's operations will be explained in the pertinent steps but is mostly used to develop the second step, which is the initial review of the organization's management system. As mentioned before, this case is developed to reach the end of the second phase in such guidelines, presenting at the end, the modifications and inclusions done to the current processes and MS elements as well as the methods and tools that would be useful in such journey.

8.4 First Phase – Planning the IMS

8.4.1 Obtaining Top Management Support and Commitment

a) *Identify Top Management.*

CCA is managed by an Executive Team, composed by seven vice-presidents and directed by CCA's CEO and president. Each executive is responsible of a specific function (see Figure 8-1) and they would decide whether or not to pursue integration of CCA management systems as a business strategy.

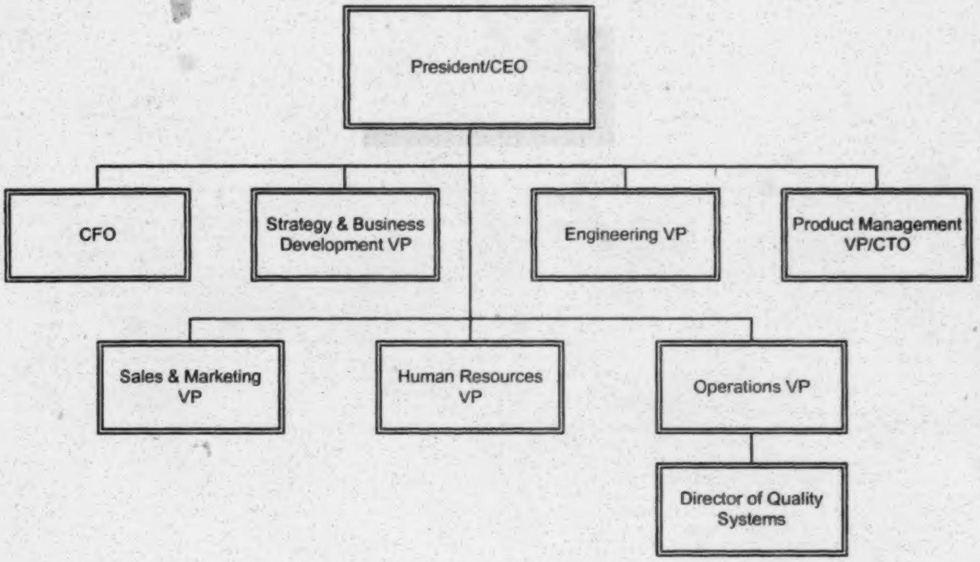

President/CEO
CFO
Strategy & Business Development VP
Engineering VP
Product Management VP/CTO
Sales & Marketing VP
Human Resources VP
Operations VP
Director of Quality Systems

Figure 8-1: CCA Organizational Chart

b) Name Management Representative

To conduct the whole integration endeavour, starting with presentations and meetings to discuss feasibility and advantages of systems integration a specific member of the organization should be chosen. Given the actual structure of CCA, an excellent choice would be the current QMS responsible, i.e. the Director of Quality Systems.

c) *Gather information and structure the case for integration*

To prepare the case for integration, information on different aspects need to be collected to provide the Executive Team with the benefits, resources and possible obstacles to be found in the integration project:

- A summary of the QMS status, the implementing history, obstacles and benefits already achieved
- General performance of CCA in terms of customer satisfaction, productivity, reliability, regulation compliance and shareholders confidence and goodwill
- Partnership and market requirements, both current and potential, for design and commercial relationships; and
- Updated information on integration issues such as proposed models, existence of guidelines and current examples (For further information see Chapter 2-Literature Survey).

For CCA a number of benefits from a possible integration of Quality and Environmental MSs were identified:

- Strong involvement with commercial partners, suppliers and customers, is essential for the company aspirations
- Being a design and development driven organization, technology progress is critical and this knowledge must be managed, shared, and deployed along the supply chain
- Resources need to be optimized to decrease costs and times of D&D, i.e. include all related issues at the beginning of the process.

d) Present the case for integration

The information collected and structured to provide strong argument for integration in the previous step should be presented to the Executive Team. The Director of Quality Systems and the Strategy & Business Development VP would be an excellent option to do it, being supported by any external entities if necessary. Consultants, partners personnel and researchers can be included to provide some light in the integration project.

e) Acceptance of integration as a business strategy

When CCA Executive Team accepts to pursue integration of MSs as a sound business strategy, they would communicate, in a formal statement, its support and commitment towards this strategy employees, and key partners. In a real life situation, the scope statement would be an IMS built over any combination of the four selected MSs. For purposes of this research it is assumed that the scope selected for CCA would be bound to Quality and Environmental issues.

8.4.2 Initial Review

Next, a systematic and comprehensive examination of CCA management elements as well as their links with stakeholders is necessary to plan the integration process. This initial review is where the research methodology ties up with the IMS implementation methodology, gathering information on the level of implementation of IMS elements in CCA structure (See Chapter 3 - Research Methodology). This review is performed using the IMS guidelines as checklist; thus, the IMS scope should be defined, in this case, embracing quality and environmental issues. Sources consulted for this initial review were mostly from ISO 9001:2000 current documentation such as CCA Quality manual, quality documents, quality procedures and quality records. Also CCA general documentation reviewed was mission statement, company's values and general information available through its webpage. As mentioned in Chapter 3, this particular review was performed by the researcher as an invited observer in a real system-wide audit to CCA QMS, thus allowing a better understanding of CCA processes and business requirements. Should the review be genuine, a specific internal audit team should be formed with possible assistance from an external consultant.

The results from this initial review are provided in Table 8-2 where all four requirements contained in the "leadership" IMS element are analyzed, listing consulted sources, existence and description of identified gaps. For instance, regarding "leadership system" this review has discovered the following: a need for an updating process of values and objectives to reflect CCA needs for partnership and innovation; a more dynamic role from the Executive Team towards QMS that must be extended when IMS is being implemented; and a performance measurement system aligned and integrated to organization's general and quality objectives.

2.0 LEADERSHIP

Element	Exist	Source	Gap	Comment
2.1 Leadership system	Yes	Quality Manual (QA 055) & Intranet Value statements Mission statement Performance measurement procedure Management responsibility Management review	Yes	• Update values according to needs of partnership and innovation essential to CCA • Plans for the IMS needs to be developed for both the implementation and running stages • More active leadership in terms of employee's and stakeholders perception • Performance measurement needs to be updated
2.2 Stakeholders focus	Yes	Quality Manual (QA 055) Customer Engagement Through NPI (PM 024) New Product Introduction (NPI) process (PG 023)	Yes	• Include suppliers and employees as key stakeholders for quality • For environmental and social issues include involved stakeholders following sequence of integration
2.3 Management commitment	Yes	Quality Manual (QA 055) & Intranet Performance measurement procedure • CCA values • Quality policy • Quality Management System • Executive Team roles and responsibilities • Performance measurement procedure • Management review	Yes	• Update related to new objectives that include environmental issues as well as shared objectives with customers and suppliers. • Include accountability as part of roles and responsibilities for the Executive Team • Arrange values in a code of conduct with a more hands on approach • Policies, objectives, resources and processes of the QMS enhanced to reach IMS requirements
2.4 Management review	Yes	Quality Manual (QA 055)	Yes	Include new issues in a progressive order according to the sequence of integration

Table 8-2:. "Leadership" Results (Extracted from Initial Review-Appendix Z)

This analysis is conducted for all seven elements found in the IMS model as well as its general requirements. In general, more training and experience in running a QMS would be desirable when engaging in new management-related projects. Also, leadership from the Executive Team needs to be enhanced and made more visible to counteract the negative antecedent of having pursuit ISO 9001 registration for three years, without actually being able to achieve it due to management delays. On the other hand, having an ISO 9001:2000-based QMS is a good head start for CCA. It facilitated to implant the process approach into management and decision-making activities and to engage key stakeholders such as customers/research partners and vendors, into CCA operations.

8.4.3 Outline IMS Implementation

Based on the results drawn from the initial review, CCA's Executive Team would normally set the scope, timeframe and sequence of integration for an IMS, which will outline an IMS implementation master plan. However, following the research methodology initial assumptions, the scope of the IMS is set to assimilate QMS and EMS, in that order. To outline this IMS implementation a project programme should be developed (See Table 8-3). A list of actions, suggested responsible personnel, timeframe and elements of control is included.

8.4.4 Enhance Top Management Leadership Skills

CCA's top management should enhance their leadership skills to create organizational conditions favourable to integration. According to the initial review and the outline plan for implementing an IMS, Executive Team Leadership Skills need to be reinforced to recuperate the confidence from employees and relevant partners about CCA's ability to implement sound management systems. One method to do it is training the Executive Team in a comprehensive range of leadership skills that facilitates building a favourable climate for integration. Suggested training issues are: change management, empowerment, motivation, performance measurement and knowledge sharing. Table 8-4 illustrates a suggested leadership skills program.

8.5 Second Phase - Implementing an IMS

For the selected IMS Scope, two second-phase cycles would be applied to reach the desired extent. First, the current CCA-QMS should be enhanced to reach IMS "all-encompassing" requirement level yet still referred to quality issues. In the second cycle, environmental issues would be embedded in all the company's processes. For purposes of illustration two main processes are selected to implement an IMS: New Product Introduction (NPI) and Integrated Circuit (IC) manufacturing.

Each of the following steps describes how the IMS would be implemented in both cycles

Aspect	Method	Responsible	Date		Comments	Feedback
			Start	Finish		
Generalities • Stakeholder focus • IMS principles • Objectives • Role as IMS drivers	Seminar	Human Resources / Quality Systems	TBA	TBA	A seminar series to reinforce understanding and commitment from top management regarding IMS basic concepts and applicability	Feedback from top management and related stakeholders. It is suggested to be applied every three months.
Leadership • Leadership styles • Change Management • Empowerment • Motivation • Cultural change • Knowledge sharing • Measurement of performance	Workshop	Human Resources	TBA	TBA	Presentations based on theory and examples taken from case studies.	Feedback from top management and related stakeholders. It is suggested to be applied every three months.

Table 8-4: Leadership Skills Training Program

8.5.1 Identify Stakeholders

CCA should identify its stakeholders in an accumulative process so they can be properly engaged into the company's processes along both implementation cycles. This identification of stakeholders should also include what their requirements are and how they can be reached. From their existing ISO 9001 QMS, CCA already has identified clients and suppliers as main stakeholders and corresponding communication channels have been opened. However, additional stakeholders need to be included in the first implementation cycle to fortify QMS requirements and prepare suitable conditions for integration. Table 8-5 describes organization's stakeholders, communication channels between CCA and each of them, and CCA's responsible areas to be included in the first IMS implementation cycle. A similar process is required for the second cycle to include environment, government, and community into the integration of environmental issues as part of the IMS (See Appendix E-1)

FIRST IMPLEMENTATION CYCLE

Stakeholder	Requirement	Area involved	Communication	Observations
Customers				
• Primary	They buy directly the semiconductor products to install them into their own electronic assemblies	• Marketing and Sales • Product Management and Technology	Close communication. Partnership for design and development	
• Secondary	They purchase assemblies or whole electronic units containing one or more of the semiconductor chips	• Marketing and Sales	Periodic communication with customers. Surveys and information available from trade and industry associations	
Suppliers	Any entity that provides resources for the organization process, including			
	• infrastructure,	• Product Management	Information exchange	Partnership is essential with electronic producers
	• equipment,	• Engineering	Design and development exchange	
	• raw material	• Engineering		Share quality objectives such as those set for reliability, product
	• technical &	• Product Management	Designs delivered for manufacturing.	
	• technological information	• Product Management	Sales order and deliveries	
	• Manufacturing processes	• Engineering	coordinated	
Employees	People working directly for the company and in payroll	• Human resources • Top management	Exchange of information Motivation and empowerment Involvement in decision making	All employees are involved, although in different degree, in the achievement of customer satisfaction
Government	Provincial and Federal agencies related to contractual customer requirements,			Licenses and permits to operate specific process and equipment are part of the government requirements. Complaints and suits for commercial transactions before governmental agencies (BBB and similar) are also part of government
	• regulating product specifications and	• Engineering	Legal channels	
	• commercial transactions	• Product Management		
		• Sales & Marketing	Legal channels	
Community	Part of the society at large where CCA is located. For the IMS purposes, the province of Ontario are considered CCA local community			
Environment	Not Applicable			

Table 8-5: Defining Stakeholders –First Implementation Cycle

8.5.2 Define values and objectives

Current Elements	Changes
Mission Statement CCA delivers standards-based System Interconnect for use by the world's leading communications, networking, storage system, and information technology vendors. CCA supports AdvancedTCA® , PCI/X, RapidIO® , and VME standards. CCA System Interconnect allows customers to link critical system components while compressing development cycles and maximizing performance.	Not required
Organizational Values **People.** CCA believes in building relationships with its stakeholders (staff, customers, partners, shareholders, the community and suppliers) that are based on respect, openness, trust and empowerment. The company values people who support the success of the whole company, having fun together all the way. **Integrity.** CCA operates with integrity, honest and fairness **Passion.** CCA acts with passion, drive and determination in all its activities and operations **Innovation.** CCA is committed to creativity, innovation and risk-taking **Excellence.** CCA strives for excellence, results and victory	**First implementation cycle (Addition)** **Customer's convergence.** CCA is sensible and fast-responsive to customer needs. **Partnership.** CCA operates in partnership with key customers and suppliers to achieve common objectives **Second implementation cycle (Addition)** **Sustainability.** CCA works towards long term relationship with its stakeholders **Corporate responsibility.** CCA is committed to preserve and improve the community and society in which is working.
Quality Policy **Current Version**. CCA is committed to design and supply semiconductor products that meet our customer expectations. We continually improve our business processes, which manage our product development, supplier interactions and customer relationships.	**Change to Proposed IMS policy.** CCA is committed to design and supply semiconductor products that meet our customer expectations. We continually improve our business processes that manage product development, supplier interactions, customer relationships, safeguarding environmental aspects and other stakeholders' requirements in an integral manner
Objectives **Current Quality Objectives** **Defectivity** – AOQ (Average Outgoing Quality) < 100 ppm **Reliability** – IC (Integrated Circuit) has to be functional for 10 years **Sensitivity to ESD** (Electrostatic Discharge) > 2 kV HBM (Human Body Model)	**First Implementation Cycle (Addition)** **Delivery time**. 100% in less than 30 days of order placement **Conceptual design time**. 100 % of new IC design performed by concurrent engineering including suppliers and customers **Second Implementation Cycle (Addition)** **Water consumption**. Lower than 5 gallons per IC **Lead – free**. No inclusion of Pb in the IC **Energy consumption**. Have manufacturer suppliers that apply efficient productive process in energy consumption (fuel and electricity) **Chemical use**. Have manufacturer suppliers that apply efficient process to reduce the levels of chemical use (perfluorocarbons)

Table 8-6: CCA Values and Objectives

CCA has a Mission Statement, a set of five values and a group of three quality objectives currently guiding its QMS. As illustrated in Table 8-6, CCA's mission statement would remain the same for the entire IMS implementation process. However, CCA values, policies and objectives would be modified to reflect IMS scope. For example, the current quality policy would be enhanced to include not only customers but also environment and other stakeholders as the main recipients of IMS activities. Furthermore, four values and six objectives would be added along both cycles to provide a sound foundation to provide stakeholders with quality service when enhancing QMS and include environmental issues in the design and development process when integrating EMS into the IMS.

8.5.3 Identify and Plan Set of Processes

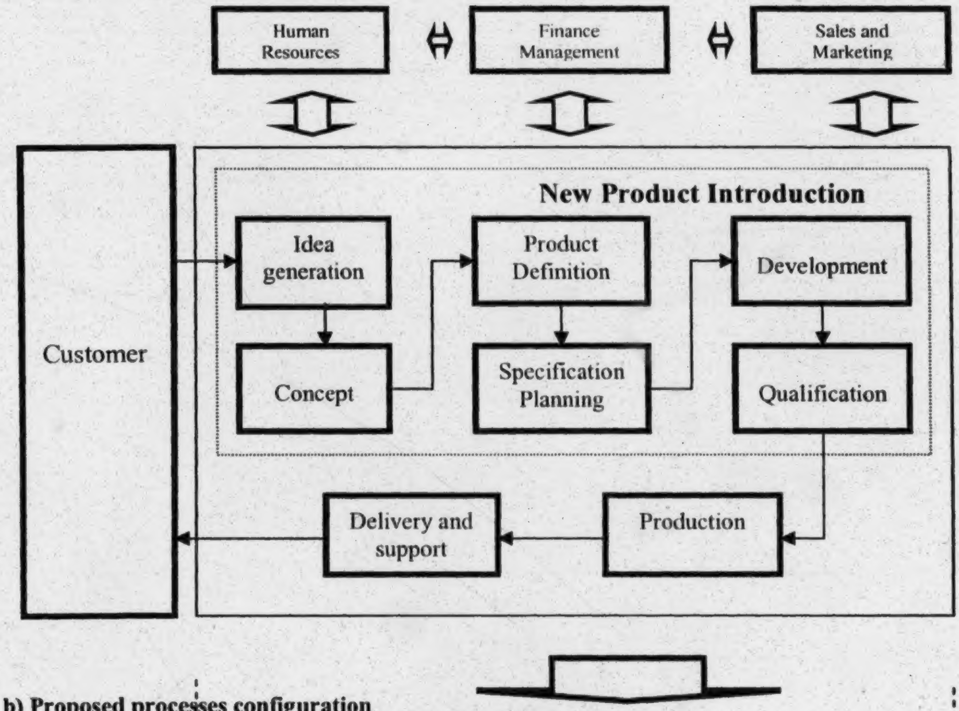
As a result of implementing an ISO 9001 QMS, CCA has already identified and documented its main processes for designing and producing its system interconnectivity products (See Top Section Figure 8-2). New Product Introduction (NPI) is the main process complemented by production and delivery and support processes. Some modifications would be done to make these processes suitable for integration:

a) Deploy a more detailed manufacturing process along with NPI process to highlight its importance even if outsourced.
b) Provide a cyclical structure for those processes to reflect its continuous improvement and the underlying PDCA cycle.
c) Expand the stakeholder basis, currently only considering customers, to include employees, suppliers and environment, according to IMS scope.

This new processes configuration is illustrated in Figure 8-2 b. Each process already contains the sequence of activities followed, clustered into a PDCA cycle. From this new representation a better understanding and visualization of interactions between these two processes and involved stakeholders is expected.

Although having a new process configuration helps for integration, information about process planning is also required. Scope, objectives, inputs and outputs defining processes are already considered by CCA. However, more detail is required for the manufacturing process. Table 8-7 presents a New Product Introduction (NPI) processes planning; the manufacturing process planning is included in Appendix E-3.

a) Current Processes


Human Resources
Finance Management
Sales and Marketing
Customer
New Product Introduction
Idea generation
Concept
Product Definition
Specification Planning
Development
Qualification
Production
Delivery and support

b) Proposed processes configuration

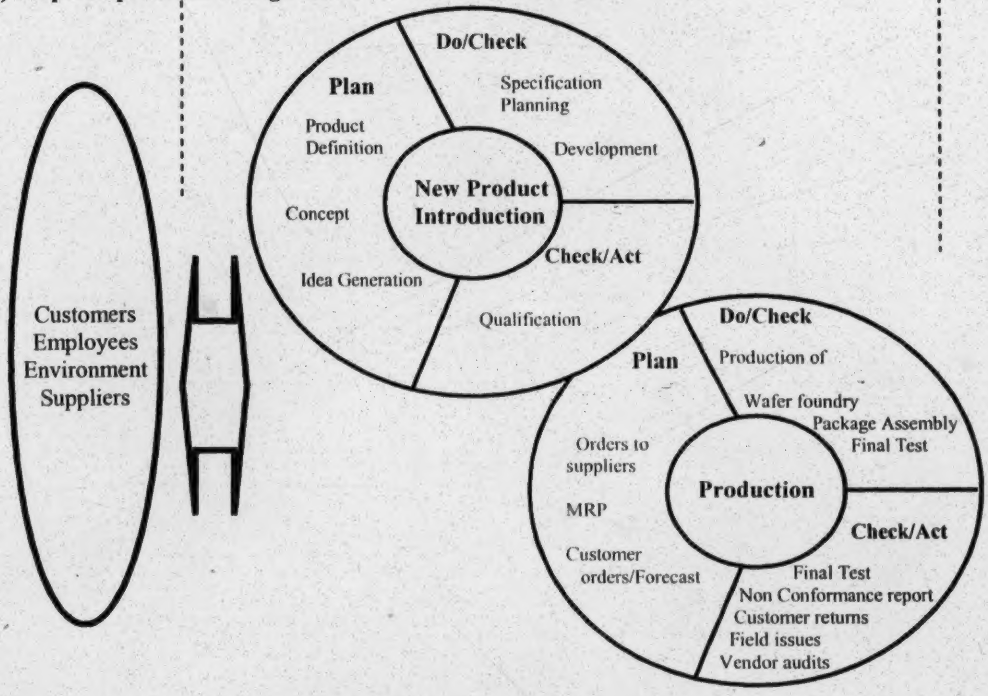

Customers
Employees
Environment
Suppliers
Plan
Product Definition
Concept
Idea Generation
Do/Check
Specification Planning
Development
New Product Introduction
Check/Act
Qualification
Plan
Orders to suppliers
MRP
Customer orders/Forecast
Do/Check
Production of
Wafer foundry
Package Assembly
Final Test
Production
Check/Act
Final Test
Non Conformance report
Customer returns
Field issues
Vendor audits

Figure 8-2: CCA Operative Processes

NEW PRODUCT INTRODUCTION (NPI) PROCESS

SCOPE	OBJECTIVES	INPUTS	OUTCOME	RESPONSIBLE
FIRST CYCLE				
Generate a complete set of design and specifications to manufacture an IC for system interconnectivity for specific customers. The product types included in the process may be: New product Product variant Co-development for product or IP Device stepping Acquired product Environmental issues, other than having specific type of products lead free, are not considered.	Several Objectives are defined • Bug rate = Zero for at least three weeks in a row • Defectivity – AOQ (Average Outgoing Quality) < 100 ppm • Quality and Reliability Assessment (ESD + Latch up + Other Assessment) • Sensitivity to ESD (Electrostatic Discharge) > 2 kV HBM (Human Body Model) • Release on time 100% • Compliance to any of the following standards: AdvancedTCA, PCI/X, RapidIO, VME • Design IC that are package lead free	• Requirements of customer(s) for standard-based system connectivity • Silicon technology knowledge • Packaging technology knowledge • Market knowledge for potential product • Portfolio assessment • Standards for system connectivity such as AdvancedTCA, PCI/X, RapidIO and VME standards	• Device taped out • Characterization results • ESD - Latch up results • Performance results • Alfa samples to customer • Field trial results • Qualification and Reliability reports • Test program • Business Case Analysis review	Main authority: Director New Product Introduction
SECOND CYCLE				
The scope of the process remains basically the same. However, environmental issues are also included when • Designing New Products which will be manufactured through regulation compliance processes and minimum impact on environment. • Programs such as recycling and better use of company's automobiles are implemented.	Include suppliers capable to comply with current environmental regulations, both in Canada and respective country where the plant is located. Objectives are: • Water consumption • Reduce atmospheric emissions of perfluorocarbons (PFCs), perfluorooctyl sulfonates (PFOS) and perfluoroalkyl sulfonates (PFAS). • Elements that minimize negative environmental impact at its end of life.	• Environmental regulations, national and international, applicable to the ICs and to the process to manufacture them. • Certifications and licenses for environmental protection from suppliers involved in the manufacturing process, i.e. wafer and package production, assembly. • Records of environmental performance of potential suppliers: air emissions, water and energy consumption, toxicity of IC parts.	• Specifications of environmental performance in air and waste emissions, water and energy consumption. • List of elements in the IC, for toxicity and environmental purposes	Main authority: Director New Product Introduction

Table 8-7: Identification & Planning NPI Process

PRODUCTION PROCESS (OUTSOURCED)

SCOPE	OBJECTIVES	INPUTS	OUTCOME	RESPONSIBILE
FIRST CYCLE				
Produce the Integrated circuits for system interconnectivity according to the design specifications set in NPI This process goes from design of the system and customer orders or forecast to the delivery to the customer and subsequent performance	• Defectivity – AOQ (Average Outgoing Quality) < 100 ppm • Reliability – IC (Integrated Circuit) has to be functional for 10 years • Sensitivity to ESD (Electrostatic Discharge) > 2 kV HBM (Human Body Model) • Ship to commit - 100 % • Overall Customer Satisfaction > 80%	• Device taped out • Characterization results • Purchase orders • Forecast • Material Resource Programme	An Integrated Circuit formed by • Wafer foundry • Package assembly • Final test/drop ship	Supply Chain Management
SECOND CYCLE				
Inclusion of environmental impacts as part of the vendor responsibilities towards CCA when manufacturing any product, i.e. wafer foundry, packaging and testing.	• Minimize water consumption • Minimize energy consumption • Reduction of atmospheric emissions of perfluorocarbons (PFCs), perfluorooctyl sulfonates (PFOS) and perfluoroalkyl sulfonates (PFAS).	• List of environmental results from development and qualification phases. • EMS and corresponding licenses and certifications from the selected suppliers for wafer foundry, packaging and testing.	Environmental performance and corresponding reports of • Water, energy consumption • Reduction of atmospheric emissions	Supply Chain Management

Table 8-7: Continued

8.5.4 Provide Training and Awareness to Employees

Being a relatively new ISO 9001 registered company (May 2005), employees are still understanding and mastering quality system elements. Therefore, reinforcement of basic management system elements, new IMS approaches and IMS elements, and awareness of new stakeholder requirements within IMS scope is required. Each cycle would include a series of training sessions, as illustrated in Table 8-8, to provide employees with IMS general concepts as well as quality/environmental concepts and techniques required to implement the IMS processes. This table also addresses the need for follow up activities, as part of employees' performance monitoring and measurement.

FIRST CYCLE

ACTIVITY	METHOD	RESPONSIBLE	FOLLOW UP
IMS Generalities 1. Stakeholder focus 2. IMS principles 3. IMS objectives 4. Assessment elements (audits principles, procedures and objectives)	Seminar or formal instruction	Human Resources Head and IMS responsible.	Every three months (for quarterly management review). A review from managers of involved departments on implementation process
Quality issues • Quality basics (PDCA, process approach, variation) • Quality tools (Quality management and quality engineering for solving problems and reduction of variation) Note: If required, to reinforce the training or education of employees in quality issues	Workshop	Human Resources Head, QMS responsible	Every three months. A review from managers of involved departments on performance in specific indicators
SECOND CYCLE			
IMS Generalities 1. Stakeholder focus 2. IMS principles 3. IMS objectives 4. Assessment elements (audits principles, procedures and objectives) Note: This issues can be changed according to the feedback from the first cycle to fill identified gaps	Workshop	Human Resources Head and IMS responsible	Every three months (for quarterly management review). A review from managers of involved departments on implementation process
Environmental issues 1. Regulation on manufacturing process of Integrated Circuits 2. Environmental basics (Aspects and impacts; emergency preparedness and response) 3. Environmental assessment methods and techniques 4. Building an environmentally conscious culture in the organization	Workshop	Human Resources Head and EMS responsible	Every three months. A review from managers of involved departments on performance in specific indicators

Table 8-8: Training Employees

8.5.5 Gather Necessary Resources

Resources for running an ISO 9001 QMS are already being deployed and used in CCA. Nonetheless, it is suggested to enhance some resources as mentioned in Appendix E-2. For example, the first implementation cycle would require considering improving the IT system so NPI and IC manufacturing process are properly integrated. A more skilled human resource is already considered from the previous section. Finally, the remaining resources would require minor additions and its priority level is left to company's considerations. On the other hand, the second implementation cycle would require more information about environmental issues from both CCA and its group of vendors that would lead to more environmental-friendly facilities, i.e. company's cars and heating and waste treatment at headquarters building. Table 8-9 shows an extract for Information Resources during both cycles highlighting, in bold letters, those new resources required.

FIRST CYCLE – ENHANCING QUALITY		
RESOURCE	**DESCRIPTION**	**SOURCE**
INFORMATION Requirements of Stakeholders and organization	• Customer Satisfaction levels • Profitability, ROI and finance rates • Productivity, reliability and other internal quality objectives • Compatibility with current systems • **Response to emergency situations of customer and suppliers, e.g. facility shut downs, special contracts with key customers**	• Customers (Main provider) • Trade associations • Suppliers
Silicon Technology	Available processes for producing wafers. Up-to-date information about • process capability, • levels of performance expected (yield) • levels of defectivity and reliability of resulting wafers • Expected costs (fixed and variables) • Limitations of the processes • **Potential technology advancements**	• Suppliers (Main provider) • Employees • Customers
SECOND CYCLE – INTEGRATING ENVIRONMENT		
INFORMATION Requirements of Stakeholders and organization	• **Regulation on environmental impacts of the IC, including life-cycle analysis. The regulations included are those applicable to headquarter communities, manufacturing facilities, and international markets** • **Alternatives for reduction on energy consumption in office regular operations** • **Alternatives for use of recycled material in office regular operations**	• Government • Advocacy groups • Community in general • Employees • Suppliers • Costumers
Silicon Technology	• **Available manufacturing process for wafer production and their specific environmental aspects, i.e. water consumption, energy consumption, air emissions, waste management**	
Packaging Technology	• **Available manufacturing process for packaging and assembling final product and their specific environmental aspects, i.e. water consumption, energy consumption, air emissions, waste management** • **Latest developments on technology, materials and processes in IC manufacturing, e.g. reduction of water consumption, Pb and Pbc's free products**	

Table 8-9: List of Resources

8.5.6 Implement New or Modify Current Processes

CCA has already identified its main processes required to satisfy its customers. To maintain consistency along the research two main processes are here analyzed to illustrate required modifications.

Following the same research methodology, two cycles are run to integrate QMS and EMS into the IMS. Since QMS is the original MS upon the IMS is built, minor adjustments regarding to quality requirements are entailed by the IMS guidelines. A total of six modifications to the current NPI process are required to meet IMS requirements for quality issues. For example, CCA would implement an emergency preparedness and response program (Section 6.2.3.2 IMS guidelines) applicable to the design and development process, which would provide CCA with the necessary means to satisfy its customers in the occurrence of an incident such as an earthquake or fire. Similarly, CCA should include in the NPI process safeguarding of stakeholder's property both physical and intellectual property (IP), including suppliers in addition to the traditional consideration of customers. These two modifications are shown in Table 8-9 while full version of applicable modifications is described in Appendix E-3.

On the other hand, environmental requirements would entail a more lengthy process since no EMS is currently in place. To do so, the same processes used in the first cycle would go under the same procedure, although this time it would take longer given the non-existence of an EMS. For instance, sixteen modifications have been defined for the NPI process to integrate environmental requirements as part of the IMS. For example, when considering purchasing IP, silicon and packaging technology for the NPI process, CCA should require them to be compliant with applicable environmental regulations both national and international (Section 6.2.2.2 IMS – Purchasing information). Other modification would require from CCA to solicit their manufacturing suppliers to perform a strict control over devices that measure air emission levels, water and chemical consumption and waste generation as part of the qualification process for alpha and beta samples (Section 6.2.3.6 IMS – Control of manufacturing control devices). Table 8-10 shows an extract of this set of modifications for each process; a full version is provided in Appendix E-3.

PROCESS - NEW INTRODUCTION PRODUCT **FIRST CYCLE – ENHANCING QUALITY**

Processes	Modification		IMS Requirement	
Development	**Modification.** CCA involves key suppliers, IP providers and IC manufacturers and assemblers, from the beginning and along the whole NPI and manufacturing processes. However, it is necessary to broad such inclusion to consider capability of suppliers to respond to emergencies from CCA and their own (include health & safety and environmental circumstances)		6.2.2.1	Supplier involvement
	None		6.2.2.2	Purchasing information
	None		6.2.2.3	Control of purchased product
	None		6.2.3.1	Control of product and service provision
	Modification. Emergency preparedness and response is not considered by CCA. Capability to respond to Tier I Customers requirements even in the face of incidents or accidents during the NPI process. For instance, in Development Phase, CCA would identify potential emergency situations and plan specific activities to respond and diminish the risk to customers. For instance		6.2.3.2	Emergency preparedness and response
	Lost of data, IP or D&D related	Have backup data from frequent saving in alternative databases		
	Fire hazards	Fire hazard programme implemented and emergency plan on alternative location		
Development	**Major inclusion** Due to the special nature of this process, CCA would require to have specific activities for safekeeping suppliers and customers property both physical (boards, testing devices, testing equipment, IC, IT devices) and IP (silicon, programming, packaging technology)		6,2.3.3	Stakeholders property

PROCESS - NEW INTRODUCTION PRODUCT **SECOND CYCLE – INTEGRATING ENVIRONMENT**

Processes	Modification	IMS Requirement	
Development	**Minor Inclusion – (Development and Qualification Phase)** When considering purchasing IP, silicon and packaging technology to use in an NPI process, CCA will require they are within environmental regulations, national and international.	6.2.2.1 6.2.2.2	Purchasing information Control of purchased product
Qualification	**Inclusion – (Qualification process)** CCA will ask from manufacturing suppliers involved in the fabrication of alpha and beta samples to perform such control over devices measuring levels of air emissions, water consumption and chemicals utilized	6.2.3.2	Control of manufacturing and measuring devices

Table 8-10: Modifying Processes (Extract)

8.5.7 Operate Processes

At the same time that identified processes are being duly implemented or modified according to IMS requirements those processes would be operated to convert particular inputs into products and by-products intended to satisfy CCA stakeholders. Although for methodological purposes implementation and operation are considered separated, both can happen simultaneously. For instance, CCA main processes, NPI and IC manufacturing, are also modified while being operated during both quality and environmental cycles.

However, CCA processes' cycle time may present a methodological conundrum when defining how long each IMS cycle will take to implement and operate quality and environmental issues. For instance, developing a new product would require having an NPI process running from more than a year while producing a fully developed product would require an IC manufacturing process to be running only for days or weeks. Therefore, running a whole NPI process cycle could take a significant long time compared with a whole IC manufacturing process cycle. In the IMS implementation methodology no consideration is mentioned about lengthy process cycles. As a consequence a rationale to define length process cycle when implementing an IMS is required.

When implementing an IMS, each cycle would have to provide sufficient data when auditing the system and measuring processes performance to prove those processes meet IMS requirements. Hence, lengthy cycles should be run for a minimum time to provide this information in a sufficient and reliable manner. For CCA, the NPI process has, by far, the longest cycle time; accumulating sufficient information for auditing and performance measurement purposes it is recommended to run an NPI process for at least six months for the first cycle while for the second the duration would be estimated later to verify initial progress and maturity achieved. On the other hand, the IC manufacturing process, with a shorter cycle time, would be operated for a similar period of time thus producing various cycles and the corresponding information and records on process and performance.

8.5.8 Auditing the System

Next step is auditing the system looking for a better understanding of such IMS and verifying also the extent of IMS elements implementation. CCA would use both the IMS guidelines and the AMS guidelines that are described in Appendices C and D, respectively to make the necessary modifications to current CCA auditing structure.

At this time, CCA has trained a five-person internal auditing team in ISO 9001 QMS fundamentals and basic auditing elements. This team has a cross functional composition, having personnel from Quality, Sales and Engineering. Their training, which was directed by an external consultant, allowed them to do an initial screening of the whole QMS. CCA has had two audits, an initial assessment by the internal auditing team and, afterwards, an external audit conducted for registration purposes. From this current auditing structure, CCA would develop an auditing system fully connected and coordinated with the IMS to assess IMS implementation progress.

To change their current auditing program to an auditing management system, able to assess and contribute to implement an IMS, CCA would change its auditing approach and enrich the management elements according to the AMS guidelines. Such approach change and enhancement of auditing elements can be appreciated in the "Auditing Resources" element, which was extracted from Appendix E-4 and displayed in Table 8-11. CCA would make the following to enhance this auditing element

- Select additional people from different areas to be part of the auditing team, thus increasing CCA capability to audit all areas and still meeting the independence auditing principle. One or two persons per functional area are suggested. These auditing members can have different roles while implementing an IMS: as facilitators in their own areas and auditors for other areas of CCA.
- Training them from the outset of IMS implementation in auditing principles, objectives, methodologies (product and process tracking are suggested). This training should be balanced with in-classroom sessions and practical experience as auditor-in-training while performing internal audits. Auditors with technical background in engineering, design and supply chain are suggested for auditing NPI and manufacturing processes in both cycles.
- The information system should be able to provide a useful platform for gathering information to perform an audit, writing audit reports and doing follow-ups for

corrective, preventive and improvement actions. Enhancing CCA Intranet for this purpose would be relatively straightforward with almost no extra cost to CCA.

AUDITING CCA IMS		
ELEMENTS	**FIRST CYCLE**	**SECOND CYCLE**
RESOURCES		
Internal auditors – Availability	• CCA has already trained a team of QMS auditors following ISO 9001 and ISO 19011 requirements. Its members comes from Quality, Sales and Engineering.	• Include environmental requirements in auditor training. Given the extent of the environmental aspects under CCA's direct control, i.e. recycling materials, conservation and reduction of energy, the weight of training is not considered burdensome. • NPI and manufacturing processes are also audited for environmental purposes. Auditors with technical background from engineering, supply chain management and design are required to audit these processes.
Internal auditors – Education.	Training should include IMS principles, approaches, and IMS fundamental concept. Auditing elements should also be included as part of the training: auditing principles, new auditing objectives; auditing methodologies and critical thinking. Training should be both in-classroom and practical	Add environmental concepts to current auditor's training such as knowledge on environmental impacts and aspects from energy consumption and recycling in offices, and water recycling, wast4e management and toxic material management involved in designing and manufacturing ICs.
Internal auditors – Evaluation	Auditors should be evaluated every six months to verify their levels of experience, knowledge and personal attributes to perform audits are adequate to IMS maturity. This evaluation should be part of employee overall evaluation.	
Involvement of personnel	As part of audit report and subsequent follow up, auditors should share their learning experiences with audited and their own areas looking to strengthen CCA processes and encourage lateral thinking for innovative solutions and methodologies.	
Maintenance of human resources	CCA, with a larger auditing team, should rotate auditors in their tasks to avoid lack of auditors from possible employee turnover	
Infrastructure	Currently, CCA has sufficient infrastructure such as buildings, IT equipment, transportation and communication means to support auditing activities.	
Information	It should adapt the QMS manual to reflect the IMS requirements, specifically, a shared platform for gathering information for auditing, writing reports and doing follow-ups. CCA Intranet is a suitable tool to do so.	CCA IMS manual should be modified to include environmental requirements from their normal operations as well as the products and processes to manufacture them

Table 8-11: Auditing Resources (Extracted from Appendix E-4)

After auditing the already implemented IMS CCA would have:

- An auditing report describing the extent of implementation of IMS elements, detected non-conformities against IMS guidelines, suggested actions and areas for improvement and learning.
- Skilled internal auditors for auditing both dimensions of the IMS, i.e. quality and environmental. To take full advantage of their knowledge in IMS and CCA processes, they can be empowered to be facilitators of IMS implementation.

- New approaches toward auditing as a process and the auditing report as a result; auditing will be considered as a valuable tool for employee training, knowledge sharing, performance measurement and improvement areas identification thus expanding current compliance assessment approach.
- Capability to perform integral IMS audits or partial QMS/EMS audits as required, taking less time than normal MS audits thus reducing disruption in CCA normal operations.

8.5.8 Measuring Stakeholders' Satisfaction

After CCA verifies that its IMS has been properly implemented and it is being operated accordingly, it should complement the verification by monitoring and measuring how the resulting IMS is meeting initially established objectives and satisfying intended stakeholders included in the IMS scope.

Currently, stakeholders' satisfaction measurement is limited to customers only.

1. Customer Surveys, which measures level of satisfaction of customers about CCA sales and delivery processes.
2. Tier I Customers Audits, which assesses CCA' operations from the Tier I Customers point of view, providing also feedback on overall results.
3. Defective Product Analysis, which analyzes information about CCA defective products and corresponding complaints from customers to correct them and prevent new occurrences.

To monitor and measure IMS performance thus assuring stakeholder engagement, CCA requires monitoring and measuring a broader range of stakeholders and their requirements to complement IMS audit report as IMS overall control.

8.5.9.1 First Cycle – Enhancing Quality

For the first implementation cycle, CCA would measure how its enhanced QMS is satisfying requirements of customers, suppliers and employees. To do so, first, current monitoring methods would be modified to measure additional requirements to cover a broader range of requirements. For instance, customer surveys directed to main customers for whom CCA does design and development (Tier I customers), should also include questions about NPI processes that will be added to those related to quality of product, sales and delivery processes. Second, new monitoring methodologies should be introduced to measure levels of satisfaction of employees and suppliers. Employee's and key supplier's survey, done in an annually basis, could help to measure their perception of CCA QMS, identifying strengths and weaknesses of the system. Supplier's surveys would be highly productive since key suppliers are only a few and the information obtained would be highly valuable. Employee's surveys would require more time, but the information obtained can help in the integration process, employee empowerment and probably higher levels of creativity and synergy between areas. For further information see Table 8-12.

Method	Description	Aspects to measure
Customer Survey	A survey done in a regular basis to CCA customers with the objective to gather information about customers' perception on quality product, sales, delivery and post services processes. Tier I customers will also measure their perception of current design and development process.	Besides quality of the product, and the sales and delivery processes as currently done, it would incorporate • new product correctness, i.e. degree to which the new product meets customer specifications; • product testability, i.e. degree of effort required to test the chips to ensure they perform intended function • product inter-operability, i.e. how well the product can be coupled with other circuits and electronic devices • product compatibility when upgrading current products for better performance • customer perception of R&D life cycle timeframe for new products
Employee's surveys	An annual survey to gather information about overall employee satisfaction about QMS in particular and CCA in general	Measuring employee's perception about • their role on decision making processes, • their level of involvement and participation; • their perception on top management commitment and constancy of purpose • consistency between objectives and recognition and reward system
Suppliers' surveys	An annual survey to gather information about key supplier's perception about their relationship with CCA QMS in particular and CCA in general	Measuring key suppliers' perception about • their role on operative processes • Flow of information from and among the supply chain • Management of conflict and trade offs • Flexibility in management process
CCA audits by customers	Audits performed by Tier I customers in an annual basis. From resulting audit reports CCA must address identified non-conformance in a timely manner	Measuring • QMS compliance against ISO 9001:2000 • QMS effectiveness • Previous suggestions and nonconformities
Complaints	Complaints from customers kept in a portfolio database. Additional information from defective product analysis	Measuring from customers • Defective product index • Failure product analysis • Compliance with agreed delivery time • Their perception on complaint handling and post service processes

Table 8-12: Measuring CCA Enhanced QMS Stakeholders' Satisfaction

8.5.9.2 Second Cycle – Including Environment

A similar process is followed when integrating EMS to form an IMS. As part of the IMS "Results" element, CCA should monitor the perception from current and additional stakeholders about IMS environmental performance in addition of its quality side. To do so, the methods used in the first cycle would be enhanced with environmental issues thus gathering information from customers, employees and suppliers. Yet, community and government perceptions in this matter should be collected and analysed. This could be done through Canadian and International Semiconductor Manufacturing Associations. Table 8-13 shows possible methods to monitor stakeholders' satisfaction with CCA IMS performance.

Method	Description	Aspects to measure
Customer Survey	A survey done in a regular basis to CCA customers with the objective to gather information about customers' perception on CCA IMS quality and environmental performance. Tier I customers will also measure their perception of current design and development process.	Besides aspects measured in the first implementation cycle, it would incorporate • life-cycle disposal requirements • existence of potential harmful elements in the IC components • potential requirements due to future regulations
Employee's surveys	An annual survey to gather information about overall employee satisfaction about IMS in particular and CCA in general	Measuring employee's perception about • CCA's environmental principles • CCA's environmental performance as part of the local community. • Their suggestions to improve IMS environmental performance
Suppliers' surveys	An annual survey to gather information about key supplier's perception about their relationship with CCA IMS in particular and CCA in general	Measuring key suppliers' perception about • Management of common environmental requirements from NPI processes • Management of common environmental requirements from IC manufacturing processes
CCA audits by customers	Audits performed by Tier I customers in an annual basis. From resulting audit reports CCA must address identified non-conformance in a timely manner	No changes are sought
Complaints	Complaints from customers kept in a portfolio database. Additional information from defective product analysis	Measuring from customers • Existence of new environmental regulations regarding product disposal and toxicity of IC components.

Table 8-13: Measuring CCA IMS Stakeholders' Satisfaction

The IMS would allow CCA to measure stakeholder's satisfaction and review system element in a continuous basis. This information will then be added to CCA's financial performance analyzed every three months would give a comprehensive panoramic of CCA operations so the CCA Executive Team can take decisions regarding to CCA in general and its IMS in particular.

However, for this research, information from auditing and stakeholders' satisfaction measurement would show CCA IMS compliance with IMS guidelines and its ability to achieve expected levels of stakeholders' satisfaction in order to identify lower-than-expected levels. If so, reasons to be identified are:

1. **IMS Design.** When values, policies, objectives or processes do not reflect properly the needs of both CCA and its stakeholders. If this is the case, CCA would usually evaluate them again to include stakeholders' close participation and confirmation. They can be involved through questionnaires, interviews or panels of experts so the IMS would have realistic information to establish IMS values, policies or objectives.
2. **IMS Implementation and operation.** Easily to detect and correct, CCA's Executive Team would identify IMS implementation gaps from auditing reports. Given the IMS scope and CCA's management system antecedents, potential problems could come from lack of leadership and of constancy during IMS operations or from lack of employee's training in IMS fundamentals.

8.5.10 Integration of Remaining MSs

In the first cycle, CCA should have basically an enhanced QMS to reach IMS level requirements. Through the second iterative loop, environmental requirements are deployed along all IMS elements, including in-house and outsourcing operative processes. After the second cycle is completed, CCA would have an IMS that can be registered to ISO 9001:2000 and ISO 14001:2004, either together or separate. With an IMS working properly, CCA Executive Team should decide how to proceed next.

There are several alternatives for CCA after completing a QMS/EMS bound IMS:

1. **Consolidate current IMS**. Mastering management concepts from CCA to obtain IMS full range of benefits such as employees' engagement, synergy between areas and systems and decrease of conflicts of interest. This alternative is strongly suggested.
2. **Augment IMS scope.** To expand CCA IMS scope there exist two alternatives. The first is increasing IMS ability to deal with particular stakeholders' requirements. For instance, managing customers' complaints by adding an ISO 10002 complaint handling program. A second approach is adding new MSs. For example, a suitable MS to integrate within CCA IMS would be a social responsibility MS. As a publicly-held company, CCA is exposed to the increasing pressure from stakeholders, government and society in general for higher levels of responsibility and accountability of their actions. To engage in social responsibility issues as part of the business strategy would be a proactive

move towards emerging requirements. Furthermore, it can provide room for mastering IMS concepts with other implementing loop iteration.

3. **Ascend IMS.** The organization would decide to enhance its IMS by including excellence principles, requirements and techniques addressed in local or national business excellence models. Having an IMS facilitates CCA in this pursuit, especially if CCA applied the third phase of IMS implementation methodology.

8.6 Summary

Through this chapter, the requirements for an IMS including requirements for a QMS and an EMS, were interpreted for a currently ISO 9001:2000 registered company, CCA. A simulated implementation process was described using real-life information, including objectives, resources and techniques to be used in each step until the IMS would be in place. From this simulation, the impact that organizational context has over the IMS implementation process was found:

- *Company's size.* A medium sized company does have sufficient resources to implement an IMS, which is built upon an already implemented MS. Nevertheless, certain amounts of time and money should be dedicated to educate employees in IMS concepts and techniques.
- *Initial conditions.* Historical performance of current MSs sets the pace and conditions an integration process would have to face. In case these conditions are unfavourable leadership has to play a very active role to change employees' perception.
- *Comprehensiveness of the framework.* The IMS conceptual framework is a comprehensive set of requirements for integration of standardized management systems that can be adapted to an ISO 9001 registered company.
- *Usefulness.* The IMS implementation methodology and the AMS model requirements are useful guidelines facilitating enhancement of QMS beyond ISO 9001:2000 and integration of an additional ISO 14001 EMS.

However, the IMS conceptual framework was found

- *Core competences.* The IMS model can be adapted to integrate quality and environmental requirements in company's core competences such as a creative process for designing new products.
- *Outsourced processes.* The IMS model must always consider productive processes even if outsourced; the IMS guidelines should address this requirement as part of Section I. IMS generalities

- *Measurement of performance*. The IMS conceptual framework requires measuring IMS performance in terms of internal performance indicators and stakeholders' levels of satisfaction. However, no specific model or methodology for integrating performance measurement is included. To fill this gap, further work is required to develop a performance measurement system, probably in a similar way used to design auditing as a component of the IMS model.
- *Implementation Cycle Duration*. There will be organizations where an IMS would include lengthy and/or asynchronous processes, especially those for research and development. Therefore, the IMS implementation methodology should address a complementary criterion to narrow down and synchronize the implementing timeframe for each MS integrated. It is suggested each company sets a time frame according to its own characteristics and IMS scope, e.g. six months first cycle and a year for the second cycle

In general, it is concluded that both IMS model and methodologies provide a sound set of guidelines for integrating EMS into an existing QMS to create an IMS. No large costs are expected from this initiative to achieve new infrastructure or hire new personnel. However, training employees and changing their management approach may be difficult. Next chapter will show a different starting point towards an IMS: an EMS

9 FROM EMS TO AN IMS :

9.1 Introduction

A second IMS simulation case is presented in this chapter to validate the IMS conceptual framework flexibility. Similar to Chapter Eight, an ISO 14001-registered Canadian company provides information to simulate the implementation of an IMS which will include also QMS requirements. The selected Case Company "B" or CCB possesses particular features that test the IMS conceptual framework flexibility and applicability. For instance, it is a large sized corporation, working in a highly regulated market to satisfy customers that are also owners and part of the community. The same methodology applied in the previous chapter and described in Chapter Three was followed to develop this IMS implementation process.

9.2 The Case Company "B" (CCB)

This company -based in a province of Western Canada- produces, distributes and delivers electrical energy to the entire province, with more than 500,000 electric customers. Power generation is mainly done using hydroelectric facilities taking advantage of the province richness in water. Also, it sells additional HVDC load to customers in other Canadian provinces and neighbouring states in the USA. CCB is a Crown Corporation, which means is owned by the province. It employs about 5000 employees that are divided in five main Business Units. Power Supply, Transmission and Distribution and Corporate Service and Marketing are the main operative BUs, supported by two BUs, in charge of the administration of the corporation itself: Finance and Administration and Corporate Relations.

During its normal activities, CCB is subject to a number of regulations, laws and agreements that span through a range of issues and stakeholders. Federal, Provincial and Association (CEA) regulations are considered in company's activities and strategies. Given the large amount of resources that this company needs, CCB has a strong impact in the province environment. An EMS, currently implemented following the requirements set in ISO 14001:1996, covers all company's activities in environmental issues. Additionally to environment, social and economic issues are also considered when setting its strategies and business plan. A set of 10 Corporate Goals comprises the Company's philosophy and objectives, ranging from employee safety, customer satisfaction and citizenship to environmental conservation and innovation. To achieve this broad range of goals, a number of Management Systems are in place along the BUs and overarching Corporate Unit (See Table 9-1).

Company's name	Case Company "B" (CCB)
Headquarters location	Western Canada
Sector	Electrical utility
Type	Generation, transmission and distribution of electricity
Size	Large with more than 5000 employees
Ownership	Government-owned
Products	Distribution of electricity
Main market features	Highly regulated Monopoly
Social enclave features	Social diversity driven Environmental conscious Social responsible Highly educated
QMS status	Quality programs isolated in some areas
EMS status	ISO 14001 registered in 2003
OHSMS status	Policy and program implemented
CSRMS status	Corporate citizenship program

Table 9-1: The CCB Profile

CCB's features that would play an important role in this integration simulation are:

1. A large corporation with a solid front-end set of objectives and values
2. Large amounts of information being managed as per requirements of the organization and a myriad of regulations to comply with
3. Five Business Units with different ways and methods to deal with their own activities and problem solving

4. The people at the province are CCB shareholders, customers and community, all at the same time. Therefore, social issues are of particular interest to them, which is rare in a private held company.

9.3 Applying the IMS Implementing Methodology Guidelines

The path from EMS to an IMS in a public electric utility will be illustrated following the IMS Implementation Methodology. According to the research methodology shown in Chapter Three, the information has been gathered from several sources: CCB's Intranet, pertinent manuals and procedures for health and safety, the Corporate Strategic Plan (CSP), environmental and quality guides and miscellaneous documentation.

From CCB's current conditions, the IMS implementing methodology is applied step by step. The first phase will define the missing elements or the modifications that are needed, translating the requirements into a complete plan for implementing the IMS. To provide some basis for comparison with CCA's, CCB's sequence of integration would be EMS plus QMS. This integration, done following the second phase of the methodology, would create an IMS spanning to all five Business Units to meet those requirements for customers, suppliers, employees, environment and environmental government agencies.

9.4 First Phase – Planning the IMS

9.4.1 Obtain Top Management Commitment

a) Identify top management

Integration is a task for teams, not for a single person. In CCB, this task would be assigned to the top management team with the participation of the management board. To work, both groups should regard integration of management systems as a strategy for improving the performance of the company in environmental and quality issues. This means full support and engagement. Figure 9-1 depicts those members of the corporation to be initially engaged

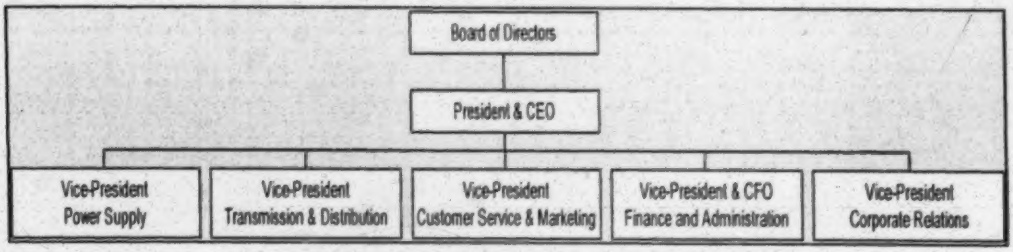

Board of Directors
President & CEO
Vice-President Power Supply
Vice-President Transmission & Distribution
Vice-President Customer Service & Marketing
Vice-President & CFO Finance and Administration
Vice-President Corporate Relations

Figure 9-1: CCB Top Management

b) Name Management Representative

A senior officer should be named IMS management representative, responsible for the planning, implementing, controlling and sustaining of the IMS as part of the regular managerial structure. Given the actual organizational structure, it is suggested to look into the Corporate Relations Unit for a suitable candidate, similarly to the representative for its EMS. However, due to the size of each Business Unit, it may be necessary to name a management representative within every BU, at least for the implementation stage.

c) Gather information and structure case for integration

The first task for the IMS representative would be gathering all the information available on integration issues such as journal publications (Quality and Management related), books and brochures from consultants, registrars and associations. This information is cross-analyzed with the actual necessities of the company in function of regulations to comply with, market development, society awareness and activism, and particular objectives and priorities. Considering CCB situation, illustrated in Table 7-1, integration would be presented as a strategy to

- Give quality a more relevant dimension into regular activities,
- Fully engage customers and employees into the system, specially as feedback providers for validation and re-design of processes or systems and,
- Spread best practices and sound relationships with stakeholders along the five BUs, building a common core of competencies and skills shared by all people while allowing specialization due to specific requirements and processes

d) Present the case for integration

This analysis should be presented to top management team. To reinforce the credibility and quality of the analysis as well as helping to clarify possible questions and concerns from top management, the presentation can be done with the participation of the registrars and consultants used for its EMS and OHSMS, CEA members and researchers from a number Canadian Universities with which the company has been working on management issues. This presentation should be formal and exhaustive.

e) Acceptance of integration as a business strategy

CCB top management would weight integration of management systems as a business strategy comparing potential benefits against its risks and work implied in carrying it out. If this case is deemed worthy, top management should communicate to CCB stakeholders of their intentions to embark in such an effort. The extent of this strategy will be outlined later after a complete review is done and information is analyzed.

9.4.2 Initial Review

After top management commit to integrate their management systems, an analysis is necessary to evaluate how CCB is currently satisfying the targeted stakeholders. In this research, the systems to integrate have been narrowed to include quality and environment. However, the company may decide to go in another direction including more and different systems. Defining the scope at this point will help the company to focus resources to study more in-depth specific systems, thus having a better understanding of the company's current managerial situation and the requirements of stakeholders, leading to well-informed decisions.

An initial review was performed by the author, focusing on EMS and QMS as the components of the simulated IMS. The information was gathered from different sources in an attempt to be as exhaustive as possible. Among the sources are:

- Intranet
- The Corporate Strategic Plan (CSP) 2004-2005
- Guide to Environmental Legislation, January 2004
- Board Annual Report
- Integrated Human Resources – Strategic Business Plan 2003/04

- Apparatus Maintenance Group Business Plan 2004/2005
- The Safety Management System for the CCB 2004/2005
- Guide to Service Quality (2004)
- Hughes (2004), Master Degree Thesis, University of Alberta

Using the colleted data, the gap between the current managerial systems in the CCB and the requirements set in the IMS guidelines is identified. The findings shows how each element in the guidelines is performed by the corporation, the sources of information for traceability purposes, and the gaps, if any, found in terms of content and context. In table 9.2 is presented the findings from the IMS "leadership" element. "Leadership" requires further enhancement by: involving stakeholders into CCB activities and decision making process; make quality a priority to improve CCB processes even thriving in a monopolistic market; name a quality and IMS representative from top management members; and update CSP objectives according to CCB conditions and real capability. In the review of Clause 6.0 (Set of processes) only one process is identified and fully analyzed: generating stations design process, to facilitate a more in-depth simulation of the implementation process. The remaining process all around five business units can be defined in the same way.

Based on the Initial review, it is concluded that CCB has a strong EMS in place that can be strengthened further by adding particular environmental requirements as described in the IMS model. For instance, detailed environmental objectives are not included in the CSP; there is a lack of consensus and best practices sharing along BUs in addressing its environmental aspects; and its information system is not utilized to its full potential to build synergy between stakeholders and processes. On the other hand, although quality objectives are included within its CSP, a recognized QMS is missing within CCB current structure. Major work is required to encourage deployment of such objectives into CCB activities even in a monopolistic market.

2.0 LEADERSHIP				
Element	**Existence**	**Source**	**Gap**	**Comment**
2.1 Leadership system	Yes	Intranet • CSP • Sustainable Development Principles • Mission statement • Employees and Customers Survey • Corporate policies for safety, environment and quality	Yes	• The link between employees and customers feedback provided in survey is weak. Leadership have some opportunities here to strengthen the management system involving stakeholders in the objectives setting process
2.2. Stakeholders focus	Yes	CSP Citizenship principles and policy Sustainable Development Principles Guide to environmental legislation	Yes	• Make more visible the role of quality for maintaining low costs, maintaining the performance of the extensive-capital facilities and improving reliability of the whole service.
2.3 Management commitment	Yes	Corporate Strategic Plan Intranet Employee Appraisal and Development Report Guide CCB Electric Board 53rd Annual Report • Corporate Goals to measure performance • Employee performance indicators	Yes	• Appoint an official management representative for the overall Quality system. A person for each BU coordinated by someone from the Top management committee can be a feasible choice. • The commitment for quality should be active and very visible. In large companies, top management is seen as a separate entity from the 'real world'. This perception should be avoided
2.4 Management review	Yes	Intranet Hughes (2004) U. of A. Thesis EMS Management Review Report (Format) Quarterly meetings of top management (President plus BU heads)	Yes	Management review is performed in a quarterly basis with the participation of the president, the VPs and members of the Board. Analysing the CSP, some objectives can seen unfeasible to reach given the company's performance in the last five years. Management should consider reviewed them to update them or design new strategies for reaching them Employee and customer feedback seems to be lacking of incorporation as input for management review.

Table 9-2: CCB Leadership Initial Review

9.4.3 Outline IMS Implementation

From the findings from the initial result, CCB's top management would be in good position to determine how the IMS would be implemented. Scope of the IMS and its sequence of integration would be the main variables to be established, thus defining the outline of implementation. As such, an IMS would be created from the existing EMS enhanced and accommodated to the level of requirements defined in the IMS guidelines. Next, quality requirements are defined and integrated into the set of management elements of the enhanced EMS, thus bringing a truly IMS that is deployed horizontally and vertically in all five BUs. A program, illustrated in Table 9-3, would define the implementation sequence, determining actions, suggested responsible personnel, timeframe and elements of control for each stage of the sequence.

9.4.4 Enhance Top Management Leadership Skills

Implementing an IMS would demand an active and visible commitment from CCB's top management to encourage employees and other stakeholders to accept the necessary changes and cooperate in a proactive manner. From the initial review it can be found that top management exercise a sound leadership, following the set of objectives established in the CSP. Nevertheless, CCB's top management faces the typical problem of any large corporation, i.e. an increasing distance from customers and the company's operations. To help them to manage such distance, it is proposed a formal training for top management that, at the same time, would provide them with concepts and tools to lead the change and maintain the constancy of purpose for integration. Two main aspects should be included: IMS conceptual framework general concepts and methods and leadership specific methods (See Table 9-4). Seminars and workshops seem to be an appropriate mean to train top management and the feedback is obtained through particular tasks along the design and implementation of CCB's IMS. This feedback, including the perception of employees and other stakeholders, is relevant to know whether the top management has and is applying already acquired leadership skills.

9.5 Second Phase - Implementing an IMS

For the second phase, CCB top management team should determine the scope and the sequence of integration to create the IMS. Given CCB's size, the initial implementation process may be limited to a single Business Unit as a pilot project. For instance, the Power Supply Unit is chosen to be the pilot Unit for the simulation of IMS implementation and the process of "Building Power Generating Facilities" is selected to illustrate Clause 6.0 Set of Processes. Top management should also determine the management systems to be integrated within this Business Unit. The scope will be applied. In this case, the IMS would start from the company's ISO 14001 registered EMS to include quality requirements in a second implementation cycle. This way, the IMS will include customers, environment, employees, suppliers, government and community as the involved stakeholders

Aspects to enhance	**Mode**	**Responsible**	**Comments**	**Feedback**
Generalities				
• Stakeholder focus • IMS basics • Objectives • Role of leaders as IMS drivers	Seminar	Human Resources (Corporate and BU related)/ Corporate Relations	A series of seminars to reinforce understanding and commitment from top management regarding IMS basic concepts and applicability	Feedback from top management and related stakeholders. This feedback should include the perception of such stakeholders n how top management is applying the IMS concepts. It is suggested to be collected every three months to evaluate performance
Leadership				
• Leadership generalities • Leadership styles • Empowerment • Motivation • Cultural change • Measurement of performance	Workshop	Human Resources (Corporate and BU related) / Corporate Relations	Presentations based on theory and examples taken from case studies (For further information see Literature survey – Section 1.2). Exercises would be from corporation current situation to be applied out of classroom	Feedback from top management and related stakeholders. This feedback should include the stakeholders' perception in how top management is leading the organization in general and the IMS implementation in particular. It is suggested to be applied every three months to evaluate performance.

Table 9-4: CCB Leadership Skills Training Program

9.5.1 Identify Stakeholders and Maintain Communication

In a large corporation such as CCB, stakeholders are numerous, with different backgrounds and interests vested on the organization. Customers, employees, suppliers, environment, community, government and NGOs are among the principal stakeholders that will be considered during both implementation cycles. Stakeholders are both demanders of a product and service and providers of resources but their degree of participation is variable, according to specific situations and issues that the organization considers of higher priority. Each cycle addresses stakeholders, identifying their needs and communication requirements in a cumulative way as illustrated in Table 9-5. For instance, customers are seen in the first implementation cycle as part of the community, thus interested on how CCB is meeting applicable environmental regulations, e.g. greenhouse gas levels of emissions. In the second cycle, customer's role is largely increased as the main target of IMS quality requirements in addition to their initial requirements. Therefore, customers are complex stakeholders that require low levels of greenhouse gases emitted, minimum disruption and variation in the electricity delivery service, and no errors in the billing process. Each of these requirements would need different forms of communication with customers. For example, quality of the billing process would require communication with customers in an individual basis while emission levels of greenhouse gases would be communicated to the entire community. A similar identification and communication process for suppliers is shown in Table 9.5. For full detail see Appendix F-1.

Defining the company's stakeholders to be satisfied by the IMS will allow CCB to direct the entire IMS resources and processes through determination of IMS values and objectives.

9.5.2 Define Values and Objectives

CCB has a strong front-end set of values and objectives, which are described in the Corporate Strategic Plan. The current version 2004-2005 of this document contains CCB's Mission Statement, Company's Vision, operating principles, and 10 current corporate objectives. Additional information from quality and environmental policies and objectives is found in CCB's Intranet. Overall, values and objectives are sound, including directions to satisfy customers, shareholders, community and government. However, some gaps were identified. Environmental objectives need to be more explicit in terms of impact upon water, vegetation and land. Quality objectives should include indicators to measure and control the overall service, including administration. Current and proposed modifications in CCB values (Table 9-6) and CCB objectives (Table 9-7) are described to direct IMS implementation and operation activities.

Stakeholder	Requirement	Area involved	Communication	Observations
First Implementation Cycle – Enhancing Environmental Requirements				
Customers	Customers are the province population itself, preserving the environment is part of the requirements that the corporation must comply with.	• Customer Service and Marketing • All five BUs	Direct exchange of information about environmental aspects in a massive bases through surveys and reports and publications of new regulations	For environmental purposes customers are considered as members of the local community
Second Implementation Cycle – Integrating Quality Requirements				
Customers	All the users of electrical power in the province, regardless they have a contractual agreement with the company or not. All customers that have contractual agreements with the corporation for provision of electrical power and related services.	• Customer Service and Marketing • Corporate Relations	Regular communication. Some surveys are performed to know the perception of customers about company's performance	Customer feedback from surveys and other methods seems to be lacking of continuity to reach top management, thus impacting in the CSP and other strategies. Surveys are also not analyzed and performed in a regular basis.
First Implementation Cycle – Enhancing Environmental Requirements				
Suppliers	CCB may require for key suppliers related to vegetation management and facilities construction to have an EMS in place aligned to CCB environmental objectives.	• Procurement (Corporate Relations) • Power Supply • Transmission & Distribution	Communication with key suppliers should include information regarding status of its EMS is required	Suppliers for construction of new infrastructure, vegetation management, and maintenance activities should have EMS and objectives aligned to CCB's
Second Implementation Cycle – Integrating Quality Requirements				
Suppliers	Any entity that provides resources for the organization process, including • infrastructure, • engineering design support • equipment, • raw materials • technical & • technological information • other services	• All five Business Units • Procurement in Corporate Relations • Engineering Design for large projects in generation, transmission or distribution infrastructure.	Information exchange New or modified designs for facilities and infrastructure delivered for Engineering Design	Share quality objectives such as those set for reliability and quality of product. Set ISO 9001 registration, or similar, as requirement for key suppliers Partnership is essential with subcontractors (Design and building of infrastructure) and key suppliers

Table 9-5: Identification of Stakeholders (Extracted from Appendix F-1)

Current Elements	Changes
Mission Statement To provide for the continuance of a supply of energy to meet the needs of the province and to promote economy and efficiency in the development, generation, transmission, distribution, supply and end-of-use of energy	Not required
Organizational Values 1. **Organizational Unity** Work together for the success of the organization as a whole, recognizing that all our activities are interrelated 2. **Partnership** Establish long-term cooperative relationships with all employees, customers, suppliers, and other stakeholders, aimed at achieving our shared Vision 3. **Encouraging working environment** Create a working environment that removes barriers to effective performance and which fosters mutual respect, trust, and open communication 4. **People approach** Provide opportunities for all employees to develop their full potential, recognizing people's inherent desire to do their best. 5. **Performance measurement driven** Measure outcomes, develop an understanding of the causes of variation from planned performance, and take appropriate action 6. **Continual improvement** Practice continuous improvements through ongoing coaching, learning, and innovation, focused on the needs and wants of internal and external customers	**First implementation cycle (Addition)** 7. **Sustainability** Work towards long-term relationship with its stakeholders **Second implementation cycle (Addition)** 8. **Sensitivity to customer's needs** Be sensible and fast responsive to customer needs.
Environmental Policy **Current Version.** In full recognition of the fact that corporate facilities and activities affect the environment, CCB integrates environmentally responsible practices into its business, thereby: • preventing or minimizing any adverse impacts, including pollution, on the environment, and enhancing positive impacts • meeting or surpassing regulatory requirements and other commitments • considering the interests and utilizing the knowledge of our customers, employees, communities, and stakeholders who may be affected by our actions • reviewing our environment objectives ad targets annually to ensure improvement in our environmental performance	**Change to Proposed IMS policy.** CCB is committed to generate, transmit and distribute energy, according to standards of technical performance that meet our customer expectations. We continually meet objectives set in integral manner that help us to improve our business processes that manage the generation and distribution of electricity, supplier interactions, customer relationships, safeguarding environmental aspects and other stakeholders' relations

Table 9-6: CCB Values definition

Current Elements	Changes
Objectives **Current Environmental Objectives** **Environmental component of CEA Customer Service Index>=** 8.5 **Corporate Citizenship Index – environmental component >=** 8.4 **Net Greenhouse Gas emissions** Overall < 0.521 megaton Electricity < 0.461 megaton Natural gas < 0.017 megaton **ISO 14001 corporate registration.** Achieve and maintain	**First Implementation Cycle (Addition)** **Water management**. 100 % reservoir levels **Use of PCBs**. Decrease in 75 % by 2010 **Water quality**. 80% water treatment **Second Implementation Cycle (Addition)** **Average electric customer outage time**. >= 92 minutes cumulative average (2000 - 04) **Average electric customer outage frequency** >= 1.3 per year cumulative average (2000 – 04) **Variations** Short duration > 30 seg - 0.8 - 1.2 pu Long duration > 30 seg - 0.1 - 1.4 pu **Voltage flicker** > 5 % **Geographical coverage** 100 % in the province **Customer satisfaction** 80% overall rating in customer surveys

Table 9-7: CCB Objectives definition

9.5.3 Identify and plan set of processes

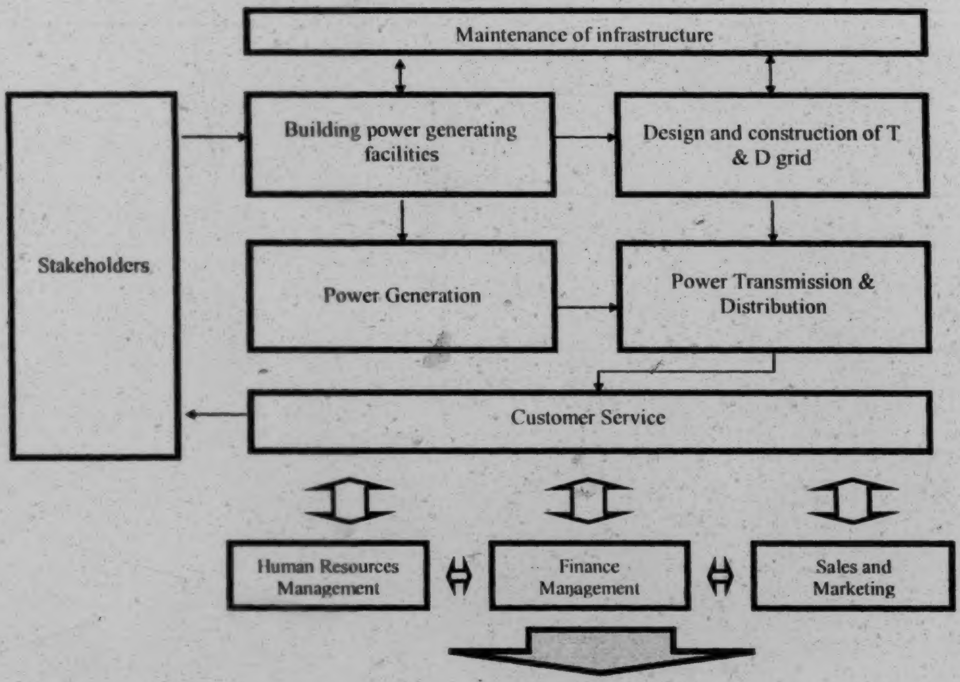
CCB is currently structured around five Business Units, using a functional approach for planning, operating and controlling activities. The existing EMS is also carried out in this managerial structure based on the PDCA cycle used in ISO 14001 standard. The main contribution from the IMS conceptual framework to CCB is the identification of high level processes as the backbone of CCB operations. These processes should be identified and their relationships between one another defined so CCB objectives are met.

Based on initial review results, it is proposed to configure CCB operative activities around six processes to include: building generating power facilities, design and construction of T&D grid, power generation, power transmission and distribution, maintenance of infrastructure, and Customer Service (illustrated at the top of Figure 9-2). Supportive processes are also identified in this figure, e.g. human resources, finance, and sales and marketing.

The IMS conceptual framework requires CCB to identify processes and subprocesses within its current operations so quality, environmental and other stakeholders' requirements are properly implemented and controlled. This implies that each of the six identified CCB processes should be identified, defining their inputs, activities, resources, and outputs. However, in this research only one process has been selected to illustrate IMS applicability with the remaining five processes following the same methodological approach. Consequently, Building Power Generation Facilities is the selected processes to exemplify the benefits of the process approach in CCB regular operations to satisfy quality and environmental requirements of its stakeholders. Figure 9-2 displays the selected process, Building Power Generation Facilities, in a cyclical sequence that includes concept, engineering design, construction and validation activities. Once a full cycle of this process, a facility is built and power is generated in another cyclical process, also illustrated at the bottom of Figure 9-2.

Identification of each process should define process scope, objective, inputs, outputs, and responsibilities. Tables 9-8 and 9-9 illustrate each of these issues for the selected process and their evolution through the first to the second implementing cycles. Also, each process should contain a structure of elements similar to the PDCA cycle. In Figure 9-2, the selected process is broken down in Concept, Engineering design, Project planning, Construction of infrastructure, Validation, Delivery to the Asset Owner, and "Lessons learned". This division will allow to the responsible to track the progress of the project and use common knowledge and methods to consider successive projects as a process.

a) High Level Processes


Maintenance of infrastructure
Stakeholders
Building power generating facilities
Design and construction of T & D grid
Power Generation
Power Transmission & Distribution
Customer Service
Human Resources Management
Finance Management
Sales and Marketing

b) Deploying CCB processes

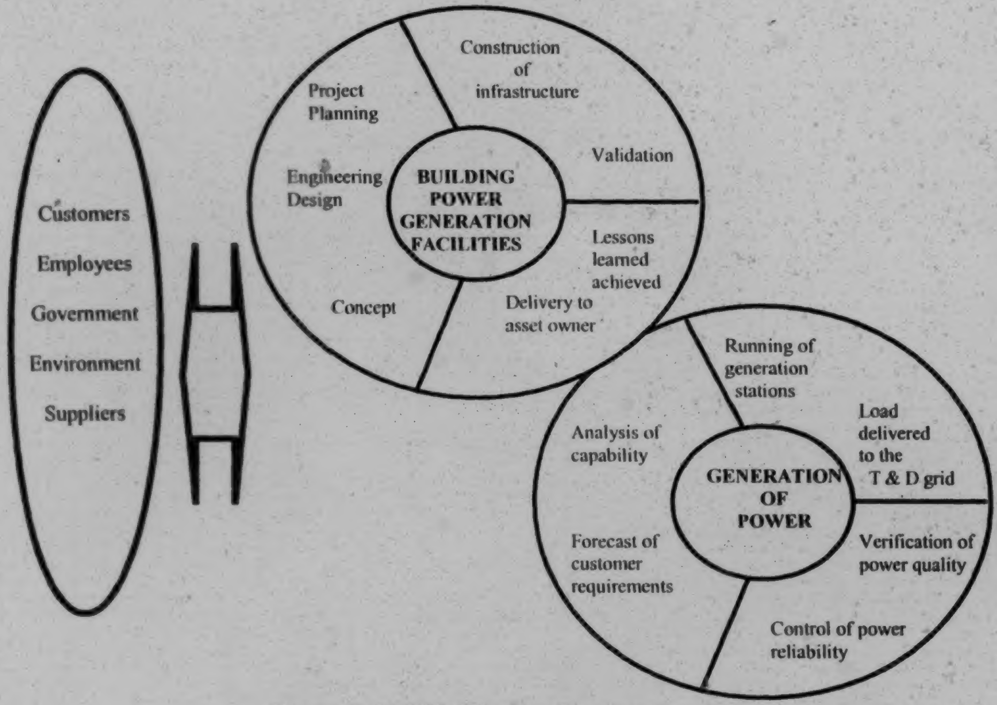

Customers
Employees
Government
Environment
Suppliers
BUILDING POWER GENERATION FACILITIES
Construction of infrastructure
Project Planning
Validation
Engineering Design
Lessons learned achieved
Concept
Delivery to asset owner
GENERATION OF POWER
Running of generation stations
Analysis of capability
Load delivered to the T & D grid
Forecast of customer requirements
Verification of power quality
Control of power reliability

Figure 9-2: CCB Diagram Processes

BUILDING POWER GENERATING FACILITIES

FIRST CYCLE - ENHANCING ENVIRONMENT

SCOPE	OBJECTIVES	INPUTS	OUTPUTS	RESPONSIBILITY
Design, construction and delivery to the asset owner of power generating installations, which includes but is not limited to: Integral Hydro electric systems, including the dam, turbines, and the powerhouse Reservoirs All weather access to the Facilities This process goes from the conceptualization of new facilities or modification of existing ones to the engineering design, bid of the project, construction and final delivery to the asset owner.	Several Objectives are defined • Compliance with applicable regulations (IEEC, ISO, CEA) • Compliance with specifications of construction • Capability of generation in terms of voltage, frequency, power quality and reliability • Minimization of disruptions on wildlife, land, water levels and quality aspects • High levels of Maintainability • Within time. For instance, 6 years for a new power generating station • Within budget, which should take into account new technologies as well as any savings from the lessons learned database	• Requirements of production of electricity (forecast of demand) • Available technology knowledge on generators, transformers and equipment in general • Standards for construction of power generation stations • Geo-technical analysis on potential places for the facility • A complete analysis of environmental impacts of potential new hydro generation stations as well as the T&D grid required • International Standards featuring electricity characteristics (IEEC, ISO, CEA)	• A new facility or a modified one for producing hydro electricity • A set of lessons learned fed to the general database for future use • A whole set of manuals for operation and maintenance of the infrastructure • Deliverance to the asset owner • Report of estimations on the real impact on the environment • Field trial results • Qualification and Reliability reports • Test program	Main authority: Director Design Engineering

Table 9-8: Defining process "Building Power Generating Facilities" First Cycle

BUILDING POWER GENERATING FACILITIES

SECOND CYCLE - INCLUDING QUALITY

SCOPE	OBJECTIVES	INPUTS	OUTCOME	RESPONSIBILITY
The scope of the process remains basically the same. However, quality issues are emphasized when • Designing and building new power generation stations relying heavily in the lessons learned databases. • Including key subcontractors and suppliers in the design stage	Include objectives of quality and elements to manage them along the value creation chain, i.e. suppliers, consumers and internal customers (Asset owner). Objectives are: • Meeting budget and timeframe in design and construction of facilities • Reduce waste in construction of facilities and related infrastructure • Minimization of non-conformances due to design and to construction • Optimize levels of maintainability and operability of the facilities	• International, national and provincial regulations applicable to the construction, operation, maintenance and decommissioning of power generating stations. • Lessons learned database • Applicable standards describing electricity, its production and transmission.	• Infrastructure ready to generate power, according to the applicable standards for quality and reliability • A set of manuals for operation and maintenance of the facilities • Records of the project describing project progress, nonconformities, changes of design, corrective and preventive actions taken • Addition of the knowledge acquired to the lessons learned database.	Main authority: Director Design Engineering

Table 9-9: Defining process "Building Power Generating Facilities" Second Cycle

9.5.4 Provide Training and Awareness to Employees

To have employees active participation in the IMS implementation, training and awareness are necessary. Furthermore, this training would facilitate building common conceptual ground between and within BUs, which is seen as an essential factor given CCB large size. A formal program is suggested for CCB, illustrated in Table 9-10. This program should include all employees in every BU, training them in IMS basic concepts and management system specifics according to the development of the IMS. For instance, during the first cycle, CCB employee's will receive training sessions dedicated mostly to IMS principles, objectives and assessment concepts and techniques; environmental training will be minimum since CCB has been working with its EMS for three years now. The second implementation cycle would reinforce IMS concepts but the core elements would be directed to quality requirements as integrated into the IMS. Further elaboration on training is described in Table 9-10, including method of training suggested, members in charge of training and follow up activities.

ACTIVITY	METHOD	RESPONSIBLE	FOLLOW UP
IMS Generalities (First and Second Cycles)			
1. Stakeholder focus. To widen the concept beyond environment 2. IMS basics (See IMS principles) 3. Assessment elements (audits principles, procedures and objectives) 4. IMS Objectives. To know the repercussions of their objectives in other employees and stakeholders	Seminar Workshop	Human Resources (Corporate Relations and, in this case, Power Supply Unit) and IMS responsible	Every three months (coupled with the quarterly management review). A review from managers of involved departments on the performance of the enhanced EMS
FIRST CYCLE – ENHANCING ENVIRONMENTAL REQUIREMENTS			
Environmental issues			
1. Regulation on construction of hydro generation facilities (manufacturing process of Integrated Circuits 2. Environmental basics (The matrix of environmental aspects and impacts; emergency preparedness and response) 3. Environmental assessment methods and techniques to include aspects beyond generation of greenhouse gases 4. Building an environmentally conscious culture in the organization	Seminar Workshop	Human Resources (Corporate Relations and the Power Supply Unit) and EMS Corporate Responsible	Every three months (coupled with the quarterly management review). A review from managers of involved departments on the performance of the enhanced EMS
SECOND CYCLE – INTEGRATING QUALITY REQUIREMENTS			
Quality issues			
• Quality basics (PDCA, process approach, variation concept) • Quality tools (Quality management and quality engineering for solving problems and reduction of variation)	Seminar Workshop	Human Resources (Corporate Relations and the Power Supply Unit) and QMS Corporate Responsible	Every three months. A review from managers of involved departments on performance in specific indicators

Table 9-10: Training Program

9.5.5 Gather Necessary Resources

Having a skilled workforce, fully aware of the IMS implications, is an asset for CCB yet more resources are necessary to achieve an IMS. Besides human resources, several resources need to be deployed along IMS structure including information, IT systems; equipment and infrastructure; and maintenance of health and safety conditions. For example, information about applicable environmental regulations, alternatives for generation and transmission of electricity, latest developments for energy saving, and assessment results of current generating facilities are required to implement the selected process, i.e. building power generation facilities. Table 9-11, an extract from appendix F-2, describes how this resource can be gathered along both cycles. Minor changes, highlighted in bold letters, are required from the current information already collected by CCB. However, this information is not always updated and its usage can be greatly enhanced by a better use of CCB intranet (See IT technology in appendix F-2).

RESOURCE	DESCRIPTION	SOURCE
FIRST CYCLE – ENHANCING ENVIRONMENT DIMENSION		
INFORMATION Requirements of Stakeholders and organization Power generation technology Technology for transmission & distribution of electricity Energy-saving technology available to customers	• Regulation on environmental impacts from operations to generate, transmit, and distribute electricity to the province population. Applicable regulations are: water quality, air emissions, land, water management, vegetation, and wildlife • Alternatives for improve efficiency on the generation and transmission of electricity of current facilities and transmitting grid • Alternatives for saving energy and better use of electricity by customers • **Latest developments on technology, materials and processes in generation, transmission and distribution of electricity to increase its efficiency, reliability and decrease overall emissions of greenhouse gases.** • Latest development in alternative methods to generate electricity, e.g. wind turbines	• Government (Environmental Protection Act) • Advocacy groups (CAE, Greenpeace) • Community in general • Employees • Suppliers • Costumers
SECOND CYCLE – INCLUDING QUALITY DIMENSION		
INFORMATION Requirements of Stakeholders and organization	• Customer Satisfaction levels • Profitability, ROI and finance rates • Reliability, power quality and other internal quality objectives • **Response to emergency situations of customer and suppliers, e.g. facility's shot downs or extreme environmental situations**	• Customers (Main provider) • Canadian Electric Association (CEA) • Suppliers • Employees
Power generation technology Technology for transmission & distribution of electricity	Available and potential technology for generation of power through renewable resources as well as for transmitting and distributing such power. Up-to-date information about: • Efficiency of generating systems and equipment • Levels of performance expected (yield) • Expected costs (fixed and variables) • Processes' limitations • **Potential technology advancements**	• Suppliers (Main provider) • Employees • Customers

Table 9-11 Information Resources required (extracted from appendix F-2)

9.5.6 Implement New or Modify Current Processes

The high-level processes identified in Section 9.5.3 exists currently within CCB structure. However, more emphasis in those processes along with their corresponding sub-processes is strongly suggested to familiarize CCB employees and stakeholders with the interactions between their requirements. Although new processes are not required in the strict sense of being missing, they need to be explicitly defined and modified to accommodate new environmental and quality requirements.

For the selected process, Building Power Generation Facilities, four sub-processes have been identified: Business Enterprise Planning (BEP), Project Planning, Implementation, and Closure. In the first implementation cycle, each of these processes requires to undergo minor modifications and additions to meet IMS requirements that are missing in ISO 14001:2004. For instance, BEP and project planning sub-processes should include environmental aspects and corresponding indicators in the design of new and modified power generating facilities, complying with IMS requirements (Clauses 6.2.1.1 to 6.2.1.7 – Design and development). These environmental aspects should be reviewed, verified and validated against regulations, contractual and voluntary agreements. Necessary changes to address identified environmental aspects should be done. Environmental aspects usually influence more than one sub-process as illustrated in Table 9-12. Appendix F-3 fully describes modifications and additions to this process to meet IMS environmental requirements.

The second implementation cycle would have a similar impact on those four sub-processes for Building Power Generation Facilities, this time to meet IMS quality requirements. For instance, BEP and project planning would be modified according to Design and Development IMS quality requirements (Clauses 6.2.1.1 to 6.2.1.7) such as reliability of generating equipment, maintainability of turbines and generating equipment, and efficiency of generation and transmission of electricity. The inputs for these processes should include historical performance of similar generating stations in CCB and other corporations and the latest developments for power generation and reliability equipment and technology. This information should be reviewed, verified and validated against CCB current and forecasted objectives.

PROCESS – BUILDING POWER GENERATION FACILITIES FIRST CYCLE – ENHANCING ENVIRONMENT

Processes	Modification/Inclusion	IMS Requirement	
Business Enterprise Planning (BEP) Project Planning Implementation Closure	**Major inclusion – (BEP and Project Planning)** Environmental aspects, along with correspondent indicators, in the design of new and modifications of power generating facilities should be emphasized. Most of the major environmental impacts of the whole corporation's activities should be prevented in the design and construction stages. Environmental aspects should be reviewed, verified and validated against regulations, contractual and voluntary agreements. For example, aspects to consider as input for BEP are water quality for community and wildlife, land and vegetation management for both the construction and operation activities. When necessary changes should be done.	6.2.1.1 6.2.1.2 6.2.1.3 6.2.1.4 6.2.1.5 6.2.1.6 6.2.1.7	D & D planning D & D inputs D & D outputs D & D reviews D & D verification D & D validation D & D changes
Project Planning	**Minor modification – (Project Planning)** The corporation, especially the Design Engineering area, should involve key suppliers, equipment providers and EPC subcontractors from the beginning and along the whole process to address environmental aspects of each project. During this stage suppliers should provide information on their capability to provide services and products that contributes to ameliorate possible negative impacts	6.2.2.3	Supplier involvement
Implementation	**Minor Inclusion – (Project Planning and Implementation)** When considering purchasing equipment and the EPC services of subcontractors, the corporation should require those services and products are within environmental regulations, provincial and national, and related specific environmental commitments to which the company has agreed.	6.2.2.4 6.2.2.5	Purchasing information Control of purchased product
	Modification – (Project Planning and Implementation stages) When developing and building a new facility for power generation, the environmental issues described in the environmental matrix should be included in the process. For example, in places determined to be reservoirs, the corporation should ensure evacuation of wildlife and make sure no harmful materials exist in the soil that may affect the quality of the water	6.2.3.1	Control of product and service provision
	Emphasis (Project Planning and Implementation stages) In the planning stage, measures should be taken to include features in the new facility that help to deal with critical emergencies such as contamination of the water, flooding, etc During the construction of the new facility, the corporation and the subcontractors should also incorporate measures for emergency preparedness and response, e.g. release of oil or other contaminants in the water	7.5.6.1	Emergency preparedness and response

Table 9-12: Implementing IMS process requirements (extract for Building Generation Facilities)

9.5.7 Operate processes

CCB would implement identified requirements into operative processes while those processes are still running to produce new product(s) and service(s). The difference between implementation and first operation is mostly for methodology purposes. After the first cycle subsequent cycles are mostly operation runs of already implemented processes. However, the duration of sub-processes and high-level processes are different because while some are relatively short, lasting days or possibly weeks, others such as project planning and implementation may take years to complete.

This divergence between time process cycles is not contemplated in the IMS implementation methodology where no timeframe for implementation/operation cycles nor criteria to establish it is provided. Similarly to CCA described in Chapter Eight, a rationale should be established to define the timeframe for each cycle, taking into account the spans of included processes, monitoring and measurement processes and historical data already acquired. All these variables should be analyzed looking to come up with a suitable time frame to gather sufficient data to measure proper implementation and achievement of IMS objectives. For instance, the selected process, building power generation facilities, could be implemented and run during a year with current or newly defined projects. To complement the information on implementation and performance of such processes, CCB may use the "lessons learned" database from previous projects to forecast what would be the most likely output.

9.5.8 Auditing the system

After each cycle is completed, CCB top management should audit the whole IMS according to the expected scope. For instance, after the second cycle is completed, a system-wide audit should be performed, probably instead of programmed system-wide EMS audits, to verify IMS requirements' existence, operation, completeness and balance.

To perform IMS audits, the IMS conceptual framework strongly suggest using internal auditors to do it. At the time of writing, CCB possesses an internal audit department dedicated to audit financial and operational processes. However, given the scope of the IMS and the size of the company an increase of internal auditors would be necessary. An alternative to have more auditors is training several members of each of the five Business units in assessment concepts and methodologies. These new auditors would be led by an auditor from the internal auditing department, thus providing expertise and skills to auditing team performance. Table 9-13 shows different aspects to cover in preparing auditors for the first and the second implementing cycle. Core issues such as education, auditor evaluation and the general auditing procedure would be reinforced from cycle to cycle by allowing the use of observers and auditor-in-training in the first cycle.

AUDITING CCB IMS

ELEMENTS	FIRST CYCLE	SECOND CYCLE
Availability	CCB has a department of internal auditors. However, a significant increase of internal auditors is required from all five Business Units Investigate auditors capability to perform integral audits (for further use in the second cycle)	Continue training to internal auditors.
Education	For internal auditors: Increasing levels of education and experience in both environmental and general auditing requirements. For external auditors It is suggested to have an experienced registrar with knowledge on environmental impacts from generation, transmission and distribution of energy as well as the applicable regulation.	Levels of experience in CCB auditing department should be improved through major involvement on IMS implementation and auditing cycles.
Auditor evaluation	Auditors should be evaluated every six months to verify their level of experience, knowledge and personal attributes to perform audits	Auditors should be evaluated every six months to verify their level of experience, knowledge and personal attributes to perform *integrated* audits
Involvement of personnel	CCB should utilize the knowledge on management system concepts, created in the first cycle, to allow auditors to share learning experiences among employees. Employees would be encouraged and involved into IMS operations by letting them define the scope and department-specific auditing objectives	CCB should implement a system to allow auditors to share their learning experiences among employees, promoting their involvement on the auditing activities in the form of "self-assessment". In this cycle, auditing should be performed with the participation of employees outside of the internal auditing department
Maintenance of human resources	CCB should rotate current auditors in their tasks to avoid loss of objectivity. Training of a larger group to avoid lack of auditors from potential employee turnover is also encouraged, especially in the second cycle reinforcing the core auditing competences	
Infrastructure	CCB has sufficient infrastructure to audit its IMS in terms of buildings, IT equipment, transportation and communication means.	
Information	CCB should create a short manual describing its IMS, including environmental requirements from their normal operations to guide auditees and auditors in their activities. Each BU would have a similar one but more suited to the specific activities and processes This information should be available to the auditors when required	CCB should update its IMS manual to describe the quality aspects and elements that were integrated This information should be available to the auditors when required

Table 9-13: Auditing Resources (Extracted from Appendix F-4)

Besides auditing resources, remaining auditing requirements should also be implemented in parallel to IMS implementation. Appendix F-4 describes the modifications to be done to the current environmental auditing programme existing in CCB. In each cycle, CCB would have the following after auditing its IMS:

- An auditing report describing IMS implementation status, non-conformities, suggested actions and follow ups.
- Skilled internal auditors along the five Business Units, capable to audit for environmental requirements and the integration of quality requirements in the first and second cycle respectively.
- Utilization of auditing as a tool for employee training , knowledge sharing, system performance measurement and improvement area identification.
- Capability to do integral audits, reducing disruption in CCB normal operations

9.5.9 Measuring Stakeholders' Satisfaction

Complementing the information about IMS extent of implementation, CCB should gather data on how associated stakeholders perceive current IMS performance in meeting their environmental and quality requirements. Then, CCB top management would have a more comprehensive understanding of the overall IMS performance.

Nowadays, CCB measures the levels perception of two stakeholders: customers and employees. This is done through:

1. **CEA Customer Survey.** Measures satisfaction of customers of all the companies' members of CEA. This survey is done every year by a third party hired from CEA over a 2500-customer sample.
2. **The CCB Customer Survey.** Measures satisfaction of the company's customers in issues related to the CSP objectives. This survey is done in a quarterly basis over a 500-customer sample
3. **The CCB Employee Survey.** Measures satisfaction of its employees in issues related to personal satisfaction, development, health and safety, etc. This survey was done only once (2004) and no regular frequency has been established to do it again.

Indeed, CCB has a number of elements to measure relevant stakeholders' satisfaction. Customer satisfaction information is gathered from the company's customers and compared with every other Canadian utility. However, employee satisfaction surveys are still underdeveloped and, since the IMS demands a higher knowledge about stakeholders' satisfaction, further development and actual use of the information on this topic are required.

9.5.9.1 First Cycle – Enhancing Environment

CCB would measure how the changes in environmental objectives and performance are being perceived by involved stakeholders. Since no specific techniques are prescribed in the IMS model guidelines for measuring stakeholders' satisfaction, CCB may use any group of indicators or performance measurement framework they decide. A suitable option would be using the same methods and indicators currently employed by CCB enriched with a more systematic use of employee's survey and the CCB complaints handling system. Overall, selected techniques and indicators should measure new environmental objectives such as levels of PCB use, land and water management defined in Section 9.5.2 (See Table 9-14 for further elaboration)

Method	Description	Aspects to measure
Customer Survey	An annual survey applied to CCB customers looking to gather information about their perception about quality, prices, service, environmental performance and social responsibility.	Besides current issues, include questions related to the use of land, water and impact on vegetation and wildlife. Given the methodology used to gather information, i.e. telephone questionnaires, the questions should be short and precise
Employee's Survey	An annual survey to gather information about employee's satisfaction and feedback about CCB in general and IMS performance in particular.	Include in the questionnaire a section where employees may grade CCB's environmental performance, adding suggestions to correct and improve specific aspects. Categories to be included in this survey may include land, water quality, vegetation, and wildlife requirements.
Governmental audits.	Audits performed by national and provincial authorities to verify corporations' compliance with environmental regulations.	Substantial and objective evidence on CCB environmental performance, which will greatly influence government and community perceptions on CCB environment performance.
Complaints	Process used by CCB to handle customer complaints can be also employed to handle and respond to stakeholders' complaints about environmental issues	Identify main environmental complaints and underpinning causes.

Table 9-14: Measuring stakeholder satisfaction about CCB environmental performance

9.5.9.2 Second Cycle – Including Quality

CCB would amplify stakeholders' satisfaction measuring techniques and indicators employed in the first implementation cycle to measure stakeholders' perception on CCB's quality performance. This inclusion of quality related indicators can actually be done from the first cycle so CCB may have historical data from before the IMS integrates quality requirements to compare later with data from the second cycle. This way, CCB would have a better perspective of stakeholders' general perception about its performance in the quality of the electricity delivery service and the administrative process.

Method	Description	Aspects to measure
Customer Survey	An annual survey applied to CCB customers looking to gather information about their perception about quality, prices, service, environmental performance and social responsibility.	Current aspects measuring quality of the electricity delivery service already included as well as Quality of administrative service, e.g. billing process, information service. Note: The design of current survey, its frequency and subsequent analysis process are robust. However, its inclusion as a main input in CCB management decision process should be fortified and formalized through the entire corporation
Employee's Survey	An annual survey to gather information about employee's satisfaction and feedback about CCB in general and IMS performance in particular.	A section in the employees' satisfaction questionnaire should be devoted to quality and customer-focused issues in perception on • leadership and commitment of top management, • level of empowerment and involvement on decision process, • suggestions for improvement of power quality, reliability and efficiency
Governmental audits.	Audits performed by national and provincial authorities to verify corporations' compliance with environmental regulations.	Not applicable.
Complaints	Process used by CCB to handle customer complaints can be also employed to handle and respond to stakeholders' complaints about environmental issues	This is an important source for understanding levels of customer satisfaction, as well as the issues that they consider the most important. Their range may encompass all areas of the Corporation but are strongly focused in • quality of the electricity delivery • related services such as billing, meter reading, advice for power savings, etc

Table 9-15: Measuring stakeholder satisfaction about CCB quality performance

Results from measuring stakeholders' satisfaction, combined with audit findings describing IMS extent of implementation and performance would indicate overall IMS performance. When the results indicate a low performance or potential problems, the IMS implementation methodology guides CCB to analyze two potential causes, each of them with specific corrective actions:

1. **Design of the IMS**. Re evaluation and changes in values, policies, objectives or process definition would be necessary. To do so participation of stakeholders may be required to design and confirm this evaluation. For instance, environmental objectives such as land and vegetation management may require assistance from experts in environmental, biology and ecosystems.
2. **Implementation and operation of the IMS.** When the problem is the lack of elements to be implemented or improper implementation or operation, CCB should determine the reasons behind them, e.g. lack of commitment of top management or lack of training, to correct them.

9.5.10 Integration of remaining MSs

At the end of the first cycle, CCB should have planned, implemented and tested enhanced environmental requirements into its existing EMS according to the IMS model guidelines. Then, the company continues integrating quality requirements to create an IMS that manages CCB environmental and quality requirements in an integral way. Once this is achieved, there are several alternatives available to CCB:

1. **Consolidation of current IMS.** Keep working with the IMS at this level and scope, mastering IMS concepts and obtaining the full range of benefits.
2. **Augment IMS scope.** Expand the scope of the IMS to incorporate other MSs or stakeholders into the IMS. A good option would be to integrate its OHSMS, which is mature enough at this point of time, and perhaps a CSRMS given the level of corporate citizenship found in the CSP.
3. **Ascend IMS.** CCB would decide to enhance its IMS by applying excellence principles and techniques such as self-assessment cycles, a more formal performance measurement system and benchmarking tools to compare with other utilities from all around the world.

9.6 Summary

In this chapter, requirements for an IMS were translated for a large public utility with an ISO 14001 registered EMS. A simulated IMS was created based on the IMS conceptual framework to meet CCB quality and environmental requirements. From this simulated construction, a number of organizational features with high impact in the IMS were:

- *Organization's Size.* A large-sized company would usually have sufficient resources to implement an IMS that includes quality and environmental requirements, requiring in most cases to educate its human resources building skills and competence in IMS concepts, approaches and techniques. However, for a large company this also means fighting against the natural organizational inertia common in large corporations.
- *Starting point.* Having a recognized EMS already working in a company facilitates the whole IMS implementation process to integrate environmental requirements with other stakeholders' requirements, in this case, quality-related.
- *Roles and responsibilities.* An IMS is not a vehicle for downsizing. Rather it encourages organizations to make more flexible and challenging employees' activities through changes in roles and responsibilities according to the changing requirements of targeted stakeholders.

On the other hand, this simulation highlights some features of the IMS framework itself such as the following:

- *Comprehensiveness of the framework.* The IMS conceptual framework facilitates integration of quality and environmental requirements into a comprehensive system beginning from an ISO 14001 based EMS.
- *Usefulness.* Requirements from the IMS implementation methodology and the AMS model provide valuable guidance to enhance an EMS beyond standardized requirements and to integrate, in a synergetic way, quality requirements that also go beyond mere ISO 9001 standard.
- *Measurement of performance.* CCB has provided evidence that performance measurement elements should be also integrated in nature. As of now, no specific model or methodology to do it is included within the IMS conceptual framework. A suitable alternative would be to design this model similarly than the AMS was developed.
- *Implementation Cycle Duration.* Similarly to CCA Research and design processes, CCB also shows IMS lack of ability to manage lengthy and asynchronous processes;

in this case, processes for building power, transmission and distribution facilities. To define the length of such cycles that assure proper implementation has been done, the IMS implementation methodology should include this definition as a requirement. This requirement should be described in terms of variables for information collection and current contextual conditions.

- *Implementation time.* Large organizations may require long implementation cycles to cover the entire company, which may cause lose of momentum. Using a Business Unit as a pilot project may help to build expertise and interest from the organization.

In general, it is concluded that the IMS conceptual framework does help to integrate environmental and quality requirements into an IMS that can be registered in ISO 14001 and ISO 9001 either alone or together. Training employees and maintain the momentum until the IMS is implemented upon the entire company are the most challenging issues.

10 Conclusions

10.1 Contributions of the Research

To integrate specific management systems in an organization, having an integrated standard that describes those selected requirements is not enough (Karapetrovic, 2003). A suitable alternative is to have a flexible and comprehensive set of guidelines describing the resulting system and how this can be done (Karapetrovic and Jonker, 2004). Building upon this assertion, an IMS Conceptual framework was designed and tested via simulation of two IMS implementation processes using real-life data. The IMS framework contains an IMS model, an IMS implementation methodology and an auditing management system model, all interrelated and contributing to integration of management system requirements.

The IMS model was developed in Chapter Four as an alternative for integration of four different and relevant MSs into a single Integrated Management System (IMS) that is also connected to the overall business management system. The four management systems selected to be part of the model, each of them described by one or more international standards and fully supported by their creative institutes and organizations are Environment, Occupational Health & Safety, Quality and Social Responsibility MSs represented by ISO 14001, OHSAS 18001 and ILO-OSH 2001, ISO 9001, and AA1000 and SA8000 respectively. The resulting model, called the IMS "Motor" Model because of its comparison with an electric motor to facilitate visualization of each element and its function into the whole system, is built upon the following elements: Leadership, Values, Objectives, Stakeholders, Resources, Processes' Set, and Results. In contrast to the IMS models found in the literature, this IMS model is capable to ascend towards excellence, to address additional stakeholders, and to integrate complementary subsystems to enhance a system's performance, all according to organization's needs. Flexibility in accommodating different starting and finishing points as well as sequences of integration is also a critical feature included in this IMS model.

To ensure robustness and balance for integration in the model, several concepts and techniques have been applied to underpin its design. First, a quality-born methodology for design, QFD, was adapted to integrate stakeholder requirements into a single management model. This application of QFD is new, since usually it is employed to design tangible products using concurrent engineering. The model elements found in the QFD analysis were deployed to create a generic framework and filled out with management requirements using an "all-encompassing" approach.

In Chapter Five the IMS implementation methodology was developed to support the IMS Model. This methodology, divided in three phases or milestones, is expected to fill the gap, identified in the literature, for methodologies to integrate standardized MSs. Special care was taken to incorporate negative and iterative loops into the implementation methodology so the whole IMS conceptual framework can be flexible and applicable to any organization regardless of its size, type and initial management status. Consequently, the methodology is able to integrate all four MSs or it can be adapted to any combination of them allowing the organization to decide the most convenient for them. The methodology even includes business excellence principles and techniques to augment and ascend the IMS' initial levels of performance, transforming it from a system solely meeting requirements described in the original standards, a Standardized IMS (S-IMS) into an Enhanced IMS (E-IMS) that strives towards excellence.

Complementing the IMS conceptual framework, the need for auditing in an integrated context was discussed. As a result, an auditing management system (AMS) model and resultant guidelines were written in Chapter Six using the IMS model structure as the basis, filled out with auditing requirements found in ISO 19011, AA1000 and auditing best practices, using an "all-encompassing" approach. To adapt auditing to IMS implementation needs, Chapter Seven studies auditing under different and innovative approaches beyond the traditional concept of auditing as an assessment tool for compliance. Auditing is then augmented and ascended by integrating requirements from self-assessment and benchmarking so it can be used for employee's training, knowledge sharing, compliance checking and improvement identification, supporting all three phases of IMS implementation. Including auditing as a subsystem of the presented IMS model confirms its ability to be:

- Augmented by including AMS to manage assurance requirements for all stakeholders,
- Assimilated by increasing the degree of closeness between IMS being audited,
- Ascended by enhancing the current management approach in search for performance excellence.

The entire IMS conceptual framework is then tested using real-life information from two Canadian companies (CC) to simulate the implementation of two IMS with different starting points but a similar finishing point. Chapters Eight and Nine each present a simulated implementation process under different organizational contexts and looking to meet different stakeholders' requirements. Assumptions to validate in these simulations are: IMS framework flexibility to address different starting points, organizational contexts, stakeholders' requirements, sequences of integration and finishing points.

From both Company Case simulations it is concluded that the IMS conceptual framework does present a comprehensive and closely tied-up set of guidelines for integration of relevant stakeholders' standardized requirements addressed in four MSs, i.e. quality, environmental, occupational health and safety, and corporate social responsibility. The IMS model can be adapted to the conditions existing in an organization and to the expected scope by using the IMS implementation methodology and the AMS model for auditing. Nevertheless, it was also found that having at least one management system in place and compliant to an international standard is definitely an asset. Contextual conditions, a very important factor within the integration process, have also been considered by the IMS conceptual framework. For instance, IMS model requirements can be adapted to medium or large organizations, to fast-paced or highly regulated environments, to global or local markets, to quality or environmental initial focus, and to the service or manufacturing sector. Furthermore, using an integrative approach would help an organization reduce its overall implementation time, to improve management of overall objectives, to reduce internal conflicts, to encourage stakeholders to a bilateral participation within the organization's activities and to find new approaches for current requirements, e.g. emergency response requirement initially environmental sided adapted to improve customers' service.

Overall, the IMS conceptual framework developed in this research is an important contribution to existing knowledge on management integration and can be used to support current initiatives for integration. For example, it can facilitate ISO's current initiative of a handbook describing integration of ISO 14001 and ISO 9001 into an organization's management structures. The IMS conceptual framework can also be used to guide the current ISO project of drafting a CSRMS standard, ISO 26000, since the

IMS model here presented also includes CSR requirements that have been taken from AA1000 and SA8000.

10.2 Research Limitations

Based on the simulation of two IMS implementation processes, two important issues were found in the IMS conceptual framework. First, no criteria are provided to define duration of IMS implementation cycles, especially in those cases where IMS processes are lengthy or asynchronous. Second, no tailored model is provided to measure, in a comprehensive and balanced way, the IMS performance. To overcome these issues is not an easy task. While IMS implementation cycle durations can be defined in terms of the organization's experience in requirements being integrated, historical data available and the level of risk of shortening specific processes to more manageable time spans, the final decision will rest in each organization's hands. Furthermore, performance measurement is a complex issue that will require further research similar to the research developed for auditing purposes and thus beyond the current research scope.

The total number of standardized MSs currently available is steadily increasing. In this research, for a number of reasons described before, a decision was made to include four most relevant standardized MSs in the integrated framework. This decision facilitates the process of integration because of the similarities in structure and content between most of the standards. However, it also leaves out of the scope non-standardized MSs such as for finance and accounting. To include them, further analysis will be required to incorporate those requirements in a way that can be adapted to different stakeholders' needs that vary from region to region and from organization to organization.

Due to the scope of the IMS, the difficulty of finding a suitable and willing company to undergo an IMS implementation process and the research project time constraints, it was not possible to do a complete implementation of an IMS. Instead, two companies were selected for an initial review and a gap analysis of their current management situation against the IMS requirement was developed. From such gap analysis, two IMS implementation processes were simulated to validate the initial IMS conceptual framework assumptions.

10.3 Venues for future research

Having conceptualized a consistent IMS framework contributes to current and future work on development, implementation, evaluation, improvement and indeed integration of MSSs done in Canada and internationally. However, further research is still required. Possible lines of development for integration of standardized management systems are:

a) Implementation of the presented IMS conceptual framework in different organizations with MSs compliant with different standards to obtain empirical data. Comparison of this data with historical information from the organization's previous performance will help to validate IMS usefulness and areas for improvement.

b) Development of methodologies and tools specifically designed to be used by the IMS. For instance, integration of different and sometimes conflicting objectives and indicators require of further study to develop methodologies for leadership and measurement of performance in an integrative environment.

c) Enhancement of the presented IMS conceptual framework to integrate non-standardized MSs such as accounting and finance. The expansion of the IMS to include financial and accounting processes could provide a better understanding of the relations between different and conflicting objectives.

d) Measurement of the degree of integration between elements in an IMS. To know whether the linkages between elements are weak or strong may be particularly interesting for researchers not only from management but also from cybernetics, information technology and manufacturing.

e) Generation of empirical data on how the organization may manage, in an IMS, different and sometimes conflicting stakeholders' needs in setting the organizational objectives.

Bibliography

1. Abbott, L. (1955). "Quality and competition". New York, Columbia University Press.

2. Abd, R. A. and Mohd, S.N. (2003). "Application of quality function deployment (QFD) method for protrusion machine design planning", *Industrial Management and Data Systems*, Vol. 103, No. 6, pp: 373-387.

3. Akao, Y. (1990). "Quality function deployment: integrating customer requirements into product design", Cambridge, Mass, Productivity Press

4. Arezes, P. M. and Miguel. A.S (2003). "The role of safety culture in safety performance measurement", *Measuring Business Excellence*, Vol. 7, No. 4, pp. 20-28.

5. Bakan, J. (2004), "The Corporation: the pathological pursuit of profit and power", New York, Free Press, 228 p.

6. Baker, P. (2001). "Raise the safety standard". *Works Management*, Vol. 54, No. 11, pp: 26-29.

7. Balbaster, F. Cruz, S. and Moreno, M. (2005), "A model of quality management self-assessment: an exploratory research", *International Journal of Quality & Reliability Management*, Vol. 22, No. 5, pp: 432-452

8. Beckmerhagen, I. A; Berg, H. P; Karapetrovic, S; and Willborn, W., (2003), "Auditing in support of the integration of management systems: a case from the nuclear industry." *Managerial Auditing Journal*, Vol. 18, No. 6, pp: 560-568.

9. Beckmerhagen, I. A; Berg, H. P; Karapetrovic, S; and Willborn, W., (2003b). "Integration of management systems: focus on safety in the nuclear industry", *International Journal of Quality and Reliability Management*, Vol. 20, No. 2, pp: 210-228.

10. Beckmerhagen, I. A; Berg, H. P; Karapetrovic, S; and Willborn, W, (2004). "On the effectiveness of quality management system audits". *The TQM Magazine*, Vol. 16, No. 1 pp: 14-25.

11. Beechner, A. B, (1997), "Integrating ISO 9001 and ISO 14001." *Quality Progress*, Vol. 30, No. 2, pp: 33-37.

12. Beecroft, G. D, (1996), "Internal quality audits - obstacles or opportunities?" *Training for Quality*, Vol. 4, No. 3, pp: 32-34.

13. Beer, S. (1979), "The Heart of the Enterprise", Chichester, John Wiley.

14. Bertalanffy, L. V., (1976), "General system Theory: Foundations, Development, Applications", New York, George Brazilier.

15. Bou-Raad, G. (2000), "Internal auditors and a value-added approach: the new business regime", *Managerial Auditing Journal*, Vol. 15, No. 4, pp: 182-187.

16. Boys, K. Karapetrovic, S. and Wilcock, A. (2004). "Is ISO 9004 a Path to Business Excellence? Opinion of Canadian Standards Experts," *International Journal of Quality and Reliability Management*, Vol. 21, No. 8, pp : 841-860

17. Brandao, F. Wilken, L.S and Dutra, F.A, (2001). "Samarco integrated management system", *Quality Congress ASQC*, Annual Quality Congress Proceedings, pp: 726-738.

18. Brenner, S. and Cochran, P. (1991), "The stakeholder theory of the firm: implications for business and society theory and research" *IABS Proceedings*, pp: 449-467

19. BSI, (1999). "OHSAS 18001:1999. Occupational health and safety Management systems – Specification", British Standards Institution.

20. Buchholz, R. A. (1991). "Corporate responsibility and the good society: from economics to ecology", *Business Horizons*, August, pp. 19-31

21. Burgess, T.F. (1998). "Modelling the impact of reengineering with system dynamics", *International Journal of Operations & Production Management*, Vol. 18, No. 9/10, pp: 950-963

22. Capaldi, N. (2005), "Corporate social responsibility and the bottom line", *International Journal of Social Economics*, Vol. 32, No. 5, pp: 408-423

23. Carraro, C. Leveque, F. (1999). "Voluntary approaches in environmental policy", Dordrecht, Kluwer Academic Publisher, pp: 1-15

24. Carroll, A. (1989), "*Business and Society: Ethics and Stakeholder Management",* Cincinnati, South Western Publishing Company.

25. Casadesus, M. Gimenez, G. and Heras, I. (2001). "Benefits of ISO 9000 implementation in Spanish industry", *European Business Review*, Vol. 13, No. 6, pp: 327-335

26. Castka, P. Bamber, C.J. Bamber, D.J. and Sharp, J.M. (2004), "Integrating Corporate Social Responsibility (CSR) into ISO management systems – in search of a feasible management system framework", *The TQM Magazine*, Vol. 16, No. 3, pp. 216-224

27. Chan, Y. K., Kan, J, Neailey, K, and Ip, W:H, (2002), "How IMS can achieve ISO 9001:2000 certification", *The TQM Magazine,* Vol. 14, No. 6, pp: 345-349.

28. Checkland, P. (1999). "Systems Thinking, Systems Practice", Chichester, John Wiley.

29. Churchman, C.W., Ackoff, R.L., and Arnoff, E.L. (1957). "Introduction to Operations Research", New York, Wiley, 3rd Edition.

30. Clarkson, M. (1988). "Corporate social performance in Canada, 1976-1986", *Research in Corporate Social Performance and Policy*. L. Preston. Greenwich, CT, JAI Press.

31. Conti, T. (2001). "Quality standards development in a hypercompetitive scenario", *The TQM Magazine*, Vol. 11, No. 6, pp: 402-408.

32. Cooper, S. (2003), "Corporate Social Responsibility. The Holy Grail", Chartered Secretary, July, pp: 12-16

33. Corcoran, I. (1996). "One goal, one standard", *Quality World*, Vol. 22, No. 10, pp: 724-726.

34. Corrington, J. P. (1994). "Is ISO 9000 the path to TQM?", *Quality Progress*, Vol. 27, No. 1 pp: 33-36.

35. Crowe, T.J. (1992), "Integration is not synonymous with flexibility", *International Journal of Operations and Production Management*, Vol. 12, No. 10, pp: 26-33

36. CSA. (1981). "CAN3-Q395-81. Quality Audits", National Standards of Canada. Toronto.

37. CSA. (1991). "CAN/CSA-Q10011-91. Guidelines for Auditing Quality Systems", National Standards of Canada. Toronto.

38. Cusins, P. (1994). "Understanding Quality through Systems Thinking." *The TQM Magazine*, Vol. 6, No. 5, pp: 19-27.

39. Dale, B. G. (2004). "Self-Assessment, Models and Quality Awards', *Managing Quality*, Oxford, Blackwell Publishers.

40. Daniels, S. E, Johnson, K. Johnson, C. (2002). "Quality glossary." *Quality Progress*, Vol. 35, No. 7, pp: 43-52.

41. Davis, R. (2004). "Corporate regulation: dead hand safeguard in the year 2004", *Balance Sheet*, Vol. 12, No. 2, pp: 16-18

42. DeAngelo, L. (1981). "Auditor size and auditor quality." *Journal of Accounting and Economics*, Vol. 12, No. 2, pp: 183-199.

43. Dee, B. Karapetrovic, S. and Webb, K. (2004). "As easy as 10001, 2, 3", *Quality Progress*, Vol. 37, No. 6, pp: 41-49

44. Deegan, C, and Rankin, M. (1996). "Do Australian companies report environmental news objectively? An analysis of environmental disclosures by firms prosecuted successfully by the Environmental Protection Authority", *Accounting, Auditing & Accountability Journal*, Vol. 9, No. 2, pp: 50-61

45. Deis, D. R. and Giroux, G.A. (1992). "Determinants of the Audit Quality in the public sector", *Accounting Review*, Vol. 67, No. 3, pp: 462-479.

46. Dessler, F. (1992), "Organization Theory: Integrating Structure and Behaviour", 2nd Edition, Prentice-Hall International, London

47. Diltz, J.D. (1995), "Does social screening affect portfolio performance?", *The Journal of Investing*, Spring, pp: 64-69

48. DiMaggio, P. and Powell, W. (1983), "The iron cage revisited: institutional isomorphism and collective rationality in organizational fields", *American Sociological Reviews*, Vol. 48, No. 1, pp: 147-160.

49. Dittenhofer, M. (2001). "Internal auditing effectiveness: an expansion of present methods", *Managerial Auditing Journal*, Vol. 16, No. 8, pp: 443-450.

50. Donaldson, T. and Preston, L. (1995). "The stakeholder theory of the corporation: Concepts, evidence", *Academy of Management*, Vol. 20, No. 1, pp: 65-92.

51. Douglas, A. and Glen, D. (2000). "Integrated management systems in small and medium enterprises", *The TQM Magazine*, Vol. 11, No. 4, pp: 686-690.

52. Droge, C. Germain, R. and Halstead, D. (1990). "A Note on Marketing and the Corporate Annual Report: 1930-1950", *Journal of the Academy of Marketing Science,* Vol. 18, No. 3, pp: 355-364.

53. Ebrahimpour, M., Withers, B.E. and Hikmet, N. (1997). "Experiences of US- and foreign-owned firms: a new perspective on ISO 9000 implementation", *International Journal of Production Research*, Vol. 35, No. 2, pp: 569-76.

54. Edgeman, R.L. (2000). "BEST business excellence: an expanded view", *Measuring Business Excellence*, Vol. 4, No. 4, pp: 15-17

55. Elkington, J. (1999). "Triple bottom-line reporting: looking for balance", *Australian CPA*, Vol. 69, No. 2, pp:18-22

56. Feingembaum, A. V. (1951). "Quality Control: Principles, practice and administration", New York, McGraw-Hill.

57. Foley, K (2004), "Meta Management", SAI Business Publishing, Sidney, Australia

58. Forrester, J. (1961). "Industrial Dynamics", Cambridge, MA, MIT Press.

59. Frankental, P. (2001), "Corporate social responsibility – a PR invention", *Corporate Communications. An International Journal*, Vol. 6, No. 1, pp: 18-23

60. Freeman, R. (1984). "Strategic Management: A Stakeholder Approach", Boston, MA, Ballinger.

61. Freimann, J. and Schwedes, R. (2000). "EMAS experiences in German companies: a survey on empirical studies", *Eco-Management and Auditing*, Vol. 7, No. 3, pp: 99-106

62. Frooman, J. (1997). "Socially irresponsible and illegal behaviour and shareholder wealth: a meta-analysis of event studies." *Business and Society*, Vol. 36, No. 3, pp: 379-389.

63. Garvare, R. and Isaksson, R. (2001). "Sustainable development: extending the scope of business excellence models", *Measuring Business Excellence*, Vol. 5, No. 3, pp: 11-15

64. Gilmore, H. L. (1974). "Product Conformance Cost", *Quality Progress*, Vol. 7, No. 5, pp: 16-19.

65. Girod, S. and Brayne, M. (2003), "Brading in European retailing: a corporate social responsibility perspective", *European Retail Digest*, Vol. 38, No. 2, pp: 1-6

66. Gobbels, M. and Jonker, J. (2003). "AA1000 and SA8000 compared: a systematic comparison of contemporary accountability standards." *Managerial Auditing Journal*, Vol. 18, No. 1, pp: 54-58.

67. Gompers, P.A. Ishii, J.L. and Metrick, A. (2003), "Corporate governance and equity prices", *Quarterly Journal of Economics*, Vol. 118, No. 1, pp: 107-115

68. Goosey, M. (2004), "End-of-life electronics legislation – an industry perspective", *Circuit World*, Vol. 30, No. 2, pp: 41-45

69. Gore, M. (1994). "The quality infrastructure", Purchasing and Supply Management, pp: 41-43.

70. Gregory, W. and Midgley, G. (2003). "Systems Thinking for Social Responsibility", *Systems Research and Behavioural Science*, Vol. 20, No. 2, pp: 103-105.

71. Heinloth, S. (1999). "Integrated management systems category, leading edge", *Quality Congress ASQC*, Annual Quality Congress Proceedings.

72. Herzwurm, G. and Schockert, S. (2003). "The leading edge in QFD for software and electronic business", *International Journal of Quality and Reliability Management*, Vol. 20, No. 1, pp: 36-55.

73. Hines, P. Holweg, M. and Rich, N. (2004). "Learning to evolve: A review of contemporary lean thinking", *International Journal of Operations & Production Management*, Vol. 24, No. 10, pp: 994-1011

74. Hitchins, D. K. (2003). "Advanced Systems. Thinking, engineering and management", Norwood. MA.

75. Hogan, C. E. and Jeter, D. (1999). "Industry Specialization by Auditors." *Auditing: A Journal of Practice and Theory*, Spring.

76. Hoyle, D. (1994). "ISO 9000 Quality Systems Handbook". Oxford, Reed Educational and Professional Publishing Ltd.

77. Hughes, S. (2004), "Quality management and complaints handling in an electrical utility", M.Sc. Thesis, University of Alberta, Edmonton, Canada

78. Idowu, S. and Towler, B. (2004), "A comparative study of contents of corporate social responsibility report of UK companies", *Management of Environmental Quality*, Vol. 15, No. 4, pp: 420-426

79. ILO, (2001). "ILO-OSH 2001. Guidelines on occupational safety and health management systems", Geneva, International Labour Office.

80. ILO, (2005). "Occupational accident and work-related disease figures by World Bank division", Geneva, International Labour Office, URL: http://www.ilo.org/public/english/protection/safework/accidis/globest_2005/world.pdf

81. ISO, (2000). "ISO 9001. Quality management systems – Requirements", International Organization for Standardization.

82. ISEA, (1999). "AA 1000 - Framework for Management", London, UK, Institute of Social and Ethical Accountability, URL: www.accountability.org

83. ISO, (2000). "ISO 9001. Quality management systems – Requirements", International Organization for Standardization, Geneva, Switzerland

84. ISO, (2002). "ISO 19011. Guidelines for quality and/or environmental management systems auditing", International Organization for Standardization, Geneva, Switzerland

85. ISO, (2003). "ISO 14001. Environmental management systems - Requirements with guidance for use", International Organization for Standardization.

86. ISO (2004). "The ISO Survey of ISO 9000 and ISO 14001 Certificates", International Organization for Standardization, Geneva, www.iso.com

87. ISO (2005), "Quality management systems – Fundamentals and vocabulary", International Organization for Standardization, Geneva.

88. Jambekar, A. (2000). "A systems thinking perspective of maintenance, operations and process quality." *Journal of Quality in Maintenance Engineering*, Vol. 6, No. 2, pp: 123-132.

89. Johnson, D. M. and Walck, C. (2001). "Integrate environmental, quality & forest certification." *Quality Congress ASQC*, Annual Quality Congress Proceedings, pp: 123-133.

90. Johnson, G. L. (2004). "Using ISO 19011 and ANSI/QE 19011S: A practitioner's perspective." *Quality Congress. ASQ's. Annual Quality Congress Proceedings*, Vol. 58, pp: 391-399.

91. Johnson, P. (1997). "ISO 9000: Meeting the International Standard". New York, NY, McGraw Hill.

92. Johnstone, K. M. Sutton, M.H. and Warfield, T.D. (2001). "Antecedents and consequences of independence risk: Framework for analysis." *Accounting Horizons*, Vol. 15, No. 1, pp: 1-18.

93. Jonker, J. and Karapetrovic, S. (2004), "Systems thinking for the integration of management systems", *Business Process Management Journal*, Vol. 10, No. 6, pp: 608-615

94. Jonker, J, and Klaver, J. (1998), "A methodological perspective of integration", *Quality World*, August, pp: 22-23

95. Jorgensen, T.H, Remmen, A. Mellado, M.D. (2005), "Integrated management systems – Three different levels of integration", *Journal of Cleaner Production*, Vol. 13, No. 8, pp. 799-813

96. Juran, J. M. and Gryna, F.M. (1974). "Quality Control Handbook". New York, McGraw-Hill.

97. Karapetrovic, S. (2002). "Strategies for the integration of management systems and standards", *The TQM Magazine*, Vol. 14, No. 1, pp: 61-67.

98. Karapetrovic, S. (2003). "Integration of Management Systems: Searching for a recipe and ingredients." *Total Quality Management and Business Excellence*, Vol. 14, No. 4, pp: 451-459.

99. Karapetrovic, S. and Willborn, W. (1998). "Integrated audit of management systems." *International journal of Operations & Production Management*, Vol. 15, No. 7, pp: 694-711.

100. Karapetrovic, S. and Willborn, W. (1998b). "Connecting internal management systems in service organizations." *Managing Service Quality*, Vol. 8, No. 4, pp: 256-271.

101. Karapetrovic, S. and Willborn, W. (1998c). "Integration of quality and environmental management systems." *The TQM Magazine*, Vol. 10, No. 3, pp: 204-213.

102. Karapetrovic, S. and Willborn, W. (1999). "Quality Audit in Financial Investment Services", *International Journal of Auditing,* Vol. 4, No. 1, pp: 139-152.

103. Karapetrovic, S. and Willborn, W. (2000). "Generic audit of management systems: fundamentals." *Managerial Auditing Journal*, Vol. 15, No. 6, pp: 279-294.

104. Karapetrovic, S. and W. Willborn (2000b). "Quality assurance and effectiveness of audit systems." *International Journal of Quality and Reliability Management*, Vol. 17, No. 6, pp: 679-703.

105. Karapetrovic, S. and Willborn, W. (2001). "Audit and self-assessment in quality management: comparison and compatibility." *Managerial Auditing Journal,* Vol. 16, No. 6, pp: 366-377.

106. Karapetrovic, S. and Willborn, W. (2001b). "Audit system: Concepts and practices." *Total Quality Management*, Vol. 12, No. 1, pp: 13-28.

107. Karapetrovic, S. and Willborn, W. (2002). "Self-audit of process performance." *International Journal of Quality & Reliability Management*, Vol. 19, No. 1, pp: 24-45.

108. Keith, N. (2003). "Due diligence and OH & S management." *OH & S Canada,* Vol. 19, No. 7, pp: 45-51.

109. Key, S. (1999). "Toward a new theory of the firm: a critique of stakeholder 'theory'", *Management Decision*, Vol. 37, No. 4, pp: 317-330.

110. Khanna, V. K. Vrat, P. Shankar, R. and Sahay, S.B. (2002). "Developing causal relationships for a TQM index for the Indian automobile sector", *Work Study,* Vol. 51, No. 7, pp: 364-373.

111. Khanna, V. K., Vrat, P. Shankar, R. and Sahay, S.B. (2003). "TQM modeling of the automobile manufacturing sector: a system dynamics approach." *Work Study,* Vol. 52, No. 2, pp: 94-101.

112. Kyro, P. (2003). "Revising the concept and forms of benchmarking." *Benchmarking: An International journal*, Vol. 10, No. 3, pp: 210-225.

113. Lantos, G.P. (2001), "The boundaries of strategic corporate social responsibility", *Journal of Consumer Marketing*, Vol. 18, No. 7, pp: 595-603

114. Laws, J. (2002). "Top of the heap", *Occupational Health & Safety*, Vol. 71, No. 10, pp: 44-47.

115. Levine, S. P. (1997). "ISO-Harmonized Management Systems: What's all the fuss about?", *American Industrial Hygiene Association Journal*, Vol. 58, No. 6, pp: 400-402.

116. Levine, S. P. and Dyjack, T.J. (1997). "Critical features of an auditable management system for an ISO 9000-Compatible Occupational health and safety standard", *American Industrial Hygiene Association Journal*, Vol. 58, No. 4, pp: 291-298.

117. Levitt, T. (1972). "Production-line approach to service", *Harvard Business Review*, Vol. 50, No. 5, pp: 41-52.

118. Lieberwitz, R.L. (2004). "Labour law in the United States: the continuing need for reform", *Managerial Law*, Vol. 46, No. 4/5, pp: 55-66

119. Liebesman, S. (2002). "New methodology for value added auditing." *Quality Congress ASQ*, Annual Quality Congress Proceedings, pp: 235-243.

120. MacGregor_Associates (1996). "Study on Management System Standards". London, British Standards Institute.

121. Mangelsdorf, D. (1999). "Evolution from quality management to an integrative management system based on TQM and its impact on the profession of quality managers in industry", *The TQM Magazine*, Vol. 11, No. 6, pp: 419-424.

122. McLachlan, V. N. (1996). "In praise of ISO 9000", *The TQM Magazine,* Vol. 8, No. 3, pp: 21-23.

123. Mearns, K. and Havold, J.I. (2003). "Occupational health and safety and the balanced scorecard", *The TQM Magazine*, Vol._15, No. 6, pp: 408-423.

124. Medori, D. and Steeple, D. (2000). "A framework for auditing and enhancing performance measurement systems." *International journal of Operations & Production Management*, Vol. 20, No. 5, pp: 520-533.

125. Miles, M. and Munilla, L. (1995). "The Eco-Marketing Orientation: An Emerging Business Philosophy", *Environmental Marketing: Strategies, Practice,Theory, Research*. The Hawthorn Press. New York, New York

126. Moir, L. (2001). "What do we mean by corporate social responsibility", *Corporate Governance*, Vol. 1, No. 2, pp: 16-22

127. Ni, Z. and Karapetrovic, S. (2003), "Perennial self-audit: model and applications", *Managerial Auditing Journal*, Vol. 18, No. 5, pp. 363-373

128. Orlitzky, M. Schmidt, F.L. and Reynes, S.L. (2003), "Corporate social and financial performance: a meta analysis", *Organization Studies*, Vol. 24, No. 3, pp: 403-441

129. Poksinska, B. Dahlgaard, J.J. and Eklund, J.A. (2003). "Implementing ISO 14000 in Sweden: Motives, benefits and comparisons with ISO 9000", *The International Journal of Quality & Reliability Management*, Vol. 20, No. 4/5, pp: 585-22

130. Polonsky, M. and Ryan, P. (1996). "The implications of stakeholder statutes for socially responsible managers", *Business and Professional Ethics Journal*, Vol. 15, No. 4, pp: 345-352.

131. Pouliot, C. (1996). "ISO 14000: Beyond Compliance to Competitiveness." *Manufacturing Engineering,* Vol.116, No.5, May 1996, pp. 51-56

132. Preston, L. and Sapienza, H. (1990). "Stakeholder management and corporate performance", *The Journal of Behavioural Economics,* Vol. 19, No. 4, pp: 361-75.

133. Pull, K. (2002). "The comparative attractiveness of international business location: the role of labour law", *Management Decision*, Vol. 40, No. 7, pp: 647-654

134. Pun, K. F. Yam, R.C. and Lewis, W.G. (2003). "Safety management system registration in the shipping industry", *International Journal of Quality and Reliability Management*, Vol. 20, No. 6, pp: 704-721.

135. RAB (2000). "Benefits of ISO 9000 Registration", Registrar Accreditation Board, USA.

136. Redinger, C. F. and Levine, S.P. (1998). "Development and evaluation of the Michigan Occupational Health and Safety management system assessment instrument: A Universal OHSMS performance measurement tool", *American Industrial Hygiene Association Journal*, Vol. 59, No. 8, pp: 572-581.

137. Reeves, C.A, and Bednar, D. A, (1994), "Defining Quality, Alternatives and Implications", *The Academy of Management Review*, Vol. 19, No. 3, pp: 419-426.

138. Rezaee, Z. Elam, R. and Sharbatoghlie, A. (2001). "Continuous auditing: the audit of the future", *Managerial Auditing Journal,* Vol. 16, No. 3, pp: 150-158.

139. Riemann, D. and Sharratt, P. (1995). "Survey of Industrial experiences with environmental management", Rugby, Institution of Chemical Engineers.

140. Robinson, S.E. (1997), "Customer satisfaction: the Xerox Canada story", *Managing Service Quality*, Vol. 7, No. 1, pp. 12-15

141. Rocha, M and Karapetrovic, S. (2003), "A Modular Three-Phased Methodology for IMS Implementation", *Proceedings from 8th International Conference on ISO 9000 and TQM,* National Quality Institute, Montreal, Canada.

142. Rocha, M. and Karapetrovic, S. (2003b), "*Merging Corporate Social Responsibility with an Integrated Management System Framework*", *Proceedings from Managing On the Edge (MOE) Conference*, Nijmegen Business School, University of Nijmegen, Holland.

143. Rocha, M. and Karapetrovic, S. (2005), "An IMS Model and Applications", Keynote Paper, *Proceedings from International Convention on Quality*, Quality and Standardization Association of Serbia and Montenegro, Belgrade, Serbia

144. Rocha, M., Searcy, C., Karapetrovic, S., McCartney, D. (2005), "Integrating Sustainable Development into Existing Management Systems", *Proceedings of the Tenth World Congress on Total Quality Management*, Total Quality Research Foundation Canada, Winnipeg, Canada

145. Rocha, M., Karapetrovic, S. (2005b), "An IMS Model and Applications", *Menadzment Totalnim Kvalitetom i Izvrsnost / Total Quality Management and Excellence,* Vol. 33, No. 1-2, pp. 25-31

146. Rohitratana, K. (2002). "SA 8000: a tool to improve quality of life." *Managerial Auditing Journal,* Vol. 17, No. 1, pp: 60-64.

147. Rondinelli, D, and Vastag, G. (2000). "Panacea, common sense, or just a label? The value of ISO 14001 environmental management systems", *European Management Journal*, Vol. 18, No. 5, pp: 499-506

148. Rowley, T. (1998). "Does relational context matter? An empirical test of a network theory of stakeh9older influences", Academy of Management 1998 Meeting, San Diego, CA.

149. Russell, J. P. (2001). "Auditing ISO 9001:2000", *Quality Progress*, Vol. 34, No. 7, pp: 147-148.

150. SAI (1999). "SA 8000. Social Accountability 8000", New York, U.S.A., Social Accountability International

151. SAI, (2003). "AS 8003. Corporate Social Responsibility", Sydney, Australia, Standards Australia International

152. Sauer, D.A. (1997), "The impact of social-responsibility screens on investment performance: Evidence from the Domini 400 Social Index and Domini Equity Mutual Fund", *Review of Financial Economics*, Vol. 6, No. 2, pp: 137-150

153. Schaltegger, S. Muller, K. and Hindrichsen, H. (1996), "Corporate Environmental Accounting", John Wiley & Sons, Chichester

154. Schumpeter, J.A. (1936), "The theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle", Cambridge< Harvard University Press

155. Scipioni, A. Arena, A. Villa, M. and Saccarola, G. (2001). "Integration of management systems", *Environmental Management and Health*, Vol. 12, No. 2, pp: 134-145.

156. Seddon, J. (1997). "Ten arguments against ISO 9000", *Managing Service Quality*, Vol. 7, No. 4, pp: 162-168.

157. Seghezzi, H.D. and Schweickardt, S. (2001), "Integration of Quality Management Into Business Management: An IAQ Project Report", *The Best on Quality*, Volume 12, International Academy for Quality, pp: 16-25

158. Senapati, N. R. (2004). "Six sigma: myths and realities", *International Journal of Quality & Reliability Management*, Vol. 21, No. 6, pp: 683-690

159. Senge, P. M. (1990). "The Fifth Discipline. The Art & Practice of the Learning Organization", Doubleday.

160. Shen, Y. and Walker, D.H.T. (2001). "Integrating OHS, EMS and QM with constructability principles when construction planning a design and construct project case study." *The Total Quality Management Magazine*, Vol. 13, No. 4, pp: 247-259.

161. Sherwood, D. (2002). "Seeing the forest for the trees. A manager's guide to applying systems thinking", London, Nicholas Brealey Publishing.

162. Smith, A. (1937). "An inquiry into the Nature and Causes of the Wealth of Nations", New York, Random House.

163. Stave, K., A. (2002). "Using system dynamics to improve public participation in environmental decisions", *System Dynamics Review*, Vol. 18, No. 2, pp: 139-168.

164. Sterman, J. (2000). "Business Dynamics: Systems Thinking and Modeling for a Complex World", McGraw-Hill.

165. Stimson, W. A. (2005), "Sarbanes Oxley and ISO 9000", *Quality Progress*, Vol. 38, No. 3, pp. 24-30

166. Streubing, L. (1996). "9000 Standards?", *Quality Progress*, Vol. 29, No. 1 pp: 23-28.

167. Sunderland, T. J. (1997). "Environmental management standards and certification; do they add value?", *ISO 14001 and beyond*. S. C. Sheffield, Greenleaf publishing.

168. Takala, J. and Obadia, I. (1997). "International dimension of occupational health and environmental health", *Environmental Management and Health*, Vol. 8, No. 5, pp: 197-198.

169. Tranmer, J. (1996). "Overcoming the problems of integrated management systems", *Quality World*, Vol. 22, No. 10, pp: 714-718.

170. Uzumeri, M. V. (1997). "ISO 9000 and other metastandards: principles for management practices?", *Academy of Management Executive* , Vol. 11, No. 1, pp: 21-36.

171. van der Wiele, T. Dale, B.G. Williams, R. (2000). "Business improvement through quality management systems." *Management Decision*, Vol. 38, No. 1, pp: 19-23.

172. van der Wiele, A. Williams, A.R.T. Brown, A. Dale, B.G. (2001). "The ISO 9000 series as a tool for organizational change: Is there a case?", *Business Process Management Journal,* Vol. 7, No. 4, pp: 323-331

173. Vendrig, L. (1996), "The route of TQM at American Express", *Managing Service Quality*, Vol. 6, No. 5, pp. 45-46

174. Vinten, G. (1998), "The competition for quality in the audit society", *Managing Service Quality*, Vol. 8, No. 6, pp. 389-394

175. Walker, D. H. T. (2000). "Client/customer or stakeholder focus? ISO 14000 EMS as a construction industry case study", *The TQM Magazine*, Vol. 12, No. 1, pp: 18-25.

176. Watkins, A. L. Hillison, W. and Morecroft, S.E. (2004). "Audit Quality: A synthesis of theory and empirical evidence", *Journal of Accounting Literature*, Vol. 23, pp: 153-193.

177. White, D. (1995). "Application of systems thinking to risk management: A review of the literature", *Management Decision*, Vol. 33, No. 10, pp: 35-45.

178. WHO, (1946). "WHO definition of Health", World Health Organization, URL: http://www.who.int/about/definition/en/

179. Wilkinson, G. and Dale, B.G. (1998). "System integration: the views and activities of certification bodies", *The TQM Magazine*, Vol. 10, No. 4, pp: 288-292.

180. Wilkinson, G. and Dale, B.G. (1999). "Integrated management systems: an examination of the concept and theory", *The TQM Magazine*, Vol. 11, No. 2, pp: 95-104.

181. Wilkinson, G. and Dale, B.G. (2001). "Integrated management systems: a model based on a total quality approach", *Managing Service Quality*, Vol. 11, No. 5, pp: 318-330.

182. Wilkinson, G. and Dale, B.G. (2002). "An examination of the ISO 9001:2000 standard and its influence on the integration of management systems", *Production planning & control*, Vol. 13, No. 3, pp: 284-297.

183. Williamson, A, Rogerson, J.H. and Vella, A.D. (1999). "Quality system auditors' attitudes and methods: a survey", *International Journal of Quality*, Vol. 13, No. 8, pp: 39-52.

184. Willborn, W. (1994). "Global management of quality assurance systems", McGraw – Hill, New York, NY, USA

185. Wood, D. (1993). "Business and Society", Glenview. IL, Scott, Foresman & Co.

186. Wooten, T. C. (2003). "Research about audit Quality", *The CPA Journal,* Vol. 73, No. 1, pp: 48-51.

187. World Bank, (1996). "Identifying Stakeholders", *Chapter III. Practice pointers in Participatory Planning and Decision-making*, URL: http://www.worldbank.org/wbi/sourcebook/sb0302t.htm

188. Wright, A. (1997). "A case study: environmental policy and procedures: special report", *Croner Publications*, Vol. 27, pp: 4-7.

189. Zadek, S. (1998), "Balancing performance, ethics, and accountability", *Journal of Business Ethics*, Dordretch, Vol. 17, No. 13, pp: 1421-1442

190. Zairi, M. (2002), "Social responsibility and impact on society", *The TQM Magazine*, Vol. 12, No. 3, pp: 172-180

191. Zambon, S. and Del Belle, A. (2005). "Towards a stakeholder responsible approach: the constructive role of reporting", *Corporate Governance*, Vol. 5, No. 2, pp: 130-141

192. Zutchi, A, and Sohal. A. (2005), "Integrated management system –The experiences of three Australian organisations", *Journal of Manufacturing Technology Management,* Vol. 16, No. 2, pp. 211-232

APPENDICES

Appendix A-1

Analysis of Stakeholders' requirements for creating an IMS

Standard/Clause	Issues Explicitly Addressed in the Standard
All Stakeholders-related	
AA1000 P1.6	Formal inclusion of representatives of stakeholders in managing processes
AA1000 Introduction; AS 3028 Clause 1.1	Applicable to any organization
AA1000 P8.6; AS 3028 Clause 2.5	Continuous improvement of processes and performance
AA1000 P1	Inclusion of stakeholders in the whole process
AA1000 P3.3	Make available its current mission and values to stakeholders
AA1000 P4.3	Comply with fair and ethical trade
AA1000 P4.3	Manage human resources in a fairly manner
AA1000 P5.2	Communicate when particular stakeholders are excluded or included into future plans
AA1000 P5.6	Report stakeholder comments on the organizational selection of issues
AA1000 P3.3	Be open and accountable to stakeholders
ISO 14001 Clause 1	Applicable to any organization
ISO 14001 Clause 4.1	Continuous improvement of processes and performance
OHSAS 18001 Clause 1; ILO-OSH Clause 3	Applicable to any organization
OHSAS 18001 Clause 5.6; ILO-OSH Clause 3.16	Continuous improvement of processes and performance
OHSAS 18001 Clause 4.2; ILO-OSH Clause 3.1.2.a, 3.10.5.1	Eliminate or minimize safety risks to employees, temporary workers, contractor personnel, visitors and any other person in the workplace
ISO 9001 Clause 1.2	Applicable to any organization
ISO 9001 Clause 8.5	Continuous improvement of processes and performance
Community-related	
AS 3028 Clause 5.2.1	Cooperate in community development
ISO 14001 Clause 4.2.g	Make organization's environmental policy publicly available
Customer-related	
AA1000 P4.3	Comply with fair and ethical trade
AS 3028 Clause 5.2.1	Have legal and honest levels of profitability
ISO 9001 Clause 1.1.b	Provide product and/or services to satisfy customer needs
ISO 9001 Clause 7.2.1.b	Provide products meeting necessary requirements for specified use or known and intended use
ISO 9001 Clause 1.1.a	Demonstrate ability to regularly satisfy customer needs
ISO 9001 Clause 1.1.a	Comply with contractual obligations
ISO 9001 Clause 7.2.3	Communicate information regarding product, enquiries, contracts, feedback and complaints
ISO 9001 Clause 7.5.4	Safeguard customer property
ISO 9001 Clause 7.2.1.d	Provide products meeting requirements of the product determined by the organization

Standard/Clause	Issues Explicitly Addressed in the Standard
Employee-related	
AA1000 P4.3	Maintain organization's values and governance
AA1000 P4.3; SA 8000	Comply with human right issues, labour and working conditions
AA1000 P4.3	Manage human resources in a fairly manner
AS 3028 Clause 5.2.1	Have legal and honest levels of profitability
AS 3028 Clause 5.2.1	Implement governance ethics in managing processes
AS 3028 Clause 5.2.1	Design ergonomic-oriented processes and operations
AS 3028 Clause 5.2.1; SA 8000 Clause 4.1	Comply with legal requirements regarding to Child labour
AS 3028 Clause 5.2.1; SA 8000 Clause 4.2	Comply with legal requirements regarding to Forced labour
AS 3028 Clause 5.2.1; SA 8000 Clause 4.3	Comply with legal and contractual requirements regarding to integral health and safety of workers
AS 3028 Clause 5.2.1; SA 8000 Clause 4.4	Promote freedomof association & right to collective bargaining
AS 3028 Clause 5.2.1; SA 8000 Clause 4.5	Comply with non-engagement in Discriminatory practices
AS 3028 Clause 5.2.1; SA 8000 Clause 4.6	Comply with non-engagement in Disciplinary practices
AS 3028 Clause 5.2.1; SA 8000 Clause 4.7	Comply with legal and industry standards for Working hours
AS 3028 Clause 5.2.1; SA 8000 Clause 4.8	Comply with legal and industry standards for Remuneration
ISO 14001 Clause 4.2.f	Communicate environmental policy to employees
ISO 14001 Clause 4.4.3.a	Communicate related environmental procedures to employees
ISO 14001 Clause 4.4.2	Provide training and awareness to employees on their participation for potential environmental impacts
OHSAS 18001 Clause 4.2.e ILO-OSH Clause 3.1.1.c	Communicate organization's OHS policy to employees
OHSAS 18001 Clause 4.2.f; ILO-OSH Clause 3.1.1.c	Make OHS policy available to employees
OHSAS 18001 Clause 4.2.c; ILO-OSH Clause 3.1.2.c	Engage and comply with OHS voluntary agreements
OHSAS 18001 Clause 4.2.e; ILO-OSH Clause 3.5.4	Communicate relevant OHS information, inclunding legal related, to employees
OHSAS 18001 Clause 4.4.3; ILO-OSH Clause 3.1.2.c	Consulted where there are any changes affecting workplace H&S.
ISO 9001 Clause 5.1.a	Communicate importance of meeting statutory, regulatory and customer requirements
ISO 9001 Clause 6.2.2.b	Provide training for personnel performing work affecting product quality
Environment-related	
AA1000 P1.6	Formal inclusion of representatives of stakeholders in managing processes
AA1000 P1	Inclusion of stakeholders in the whole process
AA1000 P4.3	Comply with legal requirements regarding to Environmental and Animal Protection
ISO 14001 Clause 1.c	Demonstrate conformity with organization's stated environmental policy
ISO 14001 Clause 4.2.b	Prevent environmental pollution
ISO 14001 Clause 4.2.c	Engage and comply with voluntary environmental agreements
ISO 14001 Clause 4.2.g	Make available organization's environmental policy publicly
ISO 14001 Clause 4.4.3.b	Provide relevant communication on environmental issues (optional)
ISO 14001 Clause 4.3.3	Consider financial and business requirements for setting environmental objectives
ISO 9001 Clause 1.1.a	Demonstrate ability to satisfy applicable regulatory requirements

Standard/Clause	Issues Explicitly Addressed in the Standard
Government-related	
AA1000 P1.6	Formal inclusion of representatives of stakeholders in managing processes
AA1000 P1	Inclusion of stakeholders in the whole process
ISO 14001 Clause 4.2.c	Comply with applicable environmental legal requirements
OHSAS 18001 Clause 4.2.f; ILO-OSH Clause 3.1.1.c	Make OHS policy available to stakeholders
OHSAS 18001 Clause 4.2.e; ILO-OSH Clause 3.5.4	Communicate relevant OHS information, includning legal related, to government
OHSAS 18001 Clause 4.2.c and 4.3.2; ILO-OSH Clause 3.1.2.b	Comply with OHS legislation
ISO 9001 Clause 1.1.a	Comply with applicable quality regulatory requirements
Labor Union-related	
AA1000 P4.3	Manage human resources in a fairly manner
OHSAS 18001 Clause 4.2.f; ILO-OSH Clause 3.1.1.c	Make OHS policy available to employees
OHSAS 18001 Clause 4.4.3; ILO-OSH 2001 Clause 3.2.1.c	Involve employees and labor union in OHS policy setting
OHSAS 18001 Clause 4.4.3; ILO-OSH Clause 3.2.2	Assurance of a safe and healthy workplace for workers
Stockholder-related	
AA1000 P4.3	Maintain organization's values and governance
AS 3028 Clause 5.2.1	Have legal and honest levels of profitability
ISO 14001 Clause 4.3.3	Consider financial and business requirements for setting environmental objectives
Supplier-related	
AS 3028 Clause 5.2.1	Implement ethical standards in relations with suppliers
AS 3028 Clause 5.2.1	Encourage community involvement of suppliers
AS 3028 Clause 5.2.1	Encourage use of employment standards by suppliers
ISO 14001 Clause 4.4.2	Provide training and awareness to suppliers, when working on organization's behalf, for potential environmental impacts
ISO 14001 Clause 4.4.6.c	Communicate applicable procedures and requirements to suppliers and contractors
OHSAS 18001 Clause 4.4.6.c; ILO-OSH Clause 3.10.5	Communicate relevant procedures and requirements in health & safety to suppliers and contractors
ISO 9001 Clause 7.4.1	Communicate to suppliers criteria for their selection, evaluation and re-evaluation
ISO 9001 Clause 7.4.3	State the intended verification arrangements and method of product release

Appendix A-2

IMS Principles

a) Stakeholders – driven

Stakeholder focus
An organization begins and ends with its stakeholders who provide it with resources and demand their specific needs to be satisfied. Thus, stakeholders should be understood and involved in organization's activities

Capable and reliable
Customers and other stakeholders require assurance and the confidence that their requirements can be met by the organization in a continuous basis. This ability should be embedded for all stakeholders and throughout the entire organization

Accountability and open communication
Openness in treatment and operations with stakeholders is an essential factor to obtain stakeholders confidence and involvement in a sustained basis. Values play an important role to develop such openness and leading to an accountable organization.

Compliance with legal regulation
An organization respectful of and compliant with applicable laws and regulations is always respected by stakeholders and the risk of being penalized is kept at minimum. However, striving in going beyond mere compliance increase proactiveness

Social and Ethical Values
A consistent set of social and ethical values is the basis for building a strong organizational culture, guiding and abiding organizations activities, especially in decision-making process to satisfy stakeholders

Partnership development
Building strong links and partnerships with key stakeholders will provide the organization with high quality resources for its operations. It should be encouraged throughout all organization's commercial associations developing a win-win approach

Awareness and training on other parties requirements
Understanding its stakeholders' needs and making those stakeholders' know and understand organization's needs will create an atmosphere of cooperation and partnership. A balanced set of objectives and results is expected when an organization involves stakeholders in such efforts.

b) Organizational – driven

Leadership
Direction and motivation should be provided by top management who should commit themselves both in words and actions. Examples provided by top management should create the required energy to run the organization.

Factual decision-making

Understanding of factual information related to company's operations and provided by an analysis, as extensive and thorough as required, is an essential ingredient for decision-making process in the organization.

Feasibility for integrating other MS standards
Improvement in satisfying more or different requirements of its stakeholders requires from an organization to develop a flexible and wide approach in its structure.

Holistic management of resources
Using a limited number of resources to satisfy organization's stakeholder requires a holistic management of such pool of resources. Proper deployment of resources should be done targeting organization's core competences.

Continual learning and improvement
An organization should incorporate a systemic approach for learning and improving possibilities. Learning process leads to core competence building and results in continuous improvement on key processes for the company

Integration to overall business management
All processes and systems within an organization should be integrated in a single and consistent entity, the actual organization. Synergy and productivity on satisfying organization's stakeholders is an expected result of this integration

Process-based approach
Satisfying stakeholders requires of a consistent effort and coordination of a number of activities. Managing them as processes augments the assurance that such satisfaction level may be achieved

Measuring of performance
Performance measurement indicates whether the organization achieves or not its goals. The organization should monitor this achievement through correlation of internal results (operational) and external results (stakeholders perception)

Flexibility in implementation and operation
The system should be flexible enough to be useful for any business unit regardless its typology and status of internal management systems. However, the sequence of implementation should be left to organization's consideration.

Appendix A-3

IMS Elements – General Description

1.0 Leadership

Leadership has been defined as "the ability to influence people toward the achievement of a common goal" Armandi et al (2003). Because of its ability in driving change, leadership spearheads the whole system. Most of the IMS benefits come from a proper promotion and understanding of changing conditions, both internal and externals.

Leadership is the changing-driver and improvement-keeper element for the entire system. Directed to influence people, that is, stakeholders, leadership requires of alignment of the organization around those stakeholders and their requirements (*Clause 2.1 and 2.2*), definition and deployment of a set of principles or values for the entire system (*Clause 2.3*), exemplification from senior management of the path to follow for satisfying stakeholders (*Clause 2.3*), and control of the process and taking actions when needed (*Clause 2.4*)

2.0 Values and 3.0 Objectives

A main consequence of leader's actions is defining organization's philosophical platform or set of values to guide and bound organization's performance. When properly done, these values will create a strong organizational culture, suitable for engaging stakeholders. The IMS set of values includes general guidelines or principles where organization's *raison d'être* is established (*Clause 3.1*), policies governing its relationship with different stakeholders in a consistent approach (*Clause 3.2*), which will result in a trusting and encouraging environment for integration of stakeholders' requirements, making them able to communicate and being accountable (*Clause 3.3*).

Objectives are the numerical expression of values and policies established by the organization, characterizing several dimensions of performance of the organization in general and functional areas in particular. The IMS requires definition of organizational objectives (*Clause 3.4*), linking explicitly the IMS values and policies to the set of process and strategies. They must be measurable and integral, avoiding or at least being aware of possible conflicts between them. To meet such established objectives, organizations should plan strategies to reach from the current organizational or particular functional performance to the planned level mentioned in those objectives (*Clause 3.5*).

4.0 Stakeholder Identification

Stakeholders are defined as those parties that have some influence and interest in the performance of an organization, providing resources and setting specific requirements that need to be met. Stakeholders include but are not limited to employees, customers, suppliers, environment, government and community. The organization should identify those stakeholders included in the IMS scope defined initially by top management (*Clause 4.0.1*). Characterizing those selected stakeholders the organization should also identify their interactions among them and with the organization for their better integration (*Clause 4.0.2*)

4.1 Stakeholder Requirements

Stakeholders expect to have their requirements fulfilled by the organization in the form of products or by-products. These requirements should be clearly defined and validated before to be fed into the IMS. Regardless the type of the stakeholder, its requirements are either related or applicable to the product(s) (*Clause 4.1.3*) or to the processes implemented to create such product(s) (*Clause 4.1.2 and 4.1.4*). For those special issues that no operative processes are in place, e.g. to write and publish a report on social and ethical issues, particular processes should be implemented to meet these stakeholders' needs.

4.2 Stakeholder Provision

A stakeholder also provides the necessary resources for the organization to run, i.e. employees provide knowledge, skills and actual work over the processes. To fortify the relationship, looking to achieve the full range of benefits, the IMS requires for the organization to build a partnership with such stakeholders (*Clause 4.2.2*), to maintain a close communication, which should be open and transparent and, for those stakeholders who need it, accountable (*Clause 4.2.3*). The IMS must be planned, the system and the derivative process, involving as much as possible the necessary stakeholders to avoid negative results hard to correct along the process (*Clause 4.2.4*). As a result, stakeholders will be able to provide a suitable resource for the IMS to work, since they are consulted from the beginning (*Clause 4.2.5*).

5.0 Resources

Resources are the energy feed into the IMS coming from different stakeholders. Their nature is very diverse, ranging from workmanship from employees, raw material and supplies from suppliers to "social contracts" from society and environment. The IMS requires for the organization to work with stakeholders to obtain the necessary resources (*Clause 5.1*). Some resources deserve special attention due to the relevance on IMS activities. For instance, human resources considers management of employees, looking to overall management, provision of training and maintenance of competence, involvement and empowerment on IMS processes and generally keeping them suited to be a dynamic part of the organization (*Clause 5.2*). Infrastructure is required by the IMS as key ingredient to run processes (*Clause 5.3*). Information is also important and the system requires elements for documentation, control of documents and records in general (*Clause 5.4*)

6.0 Identification of Processes

The "process" approach, amply used in ISO 9001:2000, is also employed in the IMS, defining two clusters of processes: Operative and supportive. Each process is built following a PDCA cycle: planning – implementing/operating – controlling – improving. Through these two concepts, process approach and PDCA, organizations can integrate their different activities and set of stakeholders. The IMS requires organizations to define their processes in terms of scope (*Clause 6.0.1*) and identify and justify those that are excluded in any given time (*Clause 6.0.2*)

6.1 Processes – Planning

Any process is the result of specific objectives or strategies, usually mixed, which starts by identifying affected stakeholders and issues to be considered. Quality, Environmental, Health and Safety, and Social Responsibility issues should be considered when setting very specific policies, e.g. quality or social responsibility (*Clause 6.1.1*), clearly identifying, in a continuous basis, the organization's legal and voluntary requirements (*Clause 6.1.2*), deploying overall objectives to functional areas and departments or processes objectives (*Clause 6.1.3 and 6.1.4*) and defining the roles of particular stakeholders in function of responsibility, authority and accountability (*Clause 6.1.5*). In the end, a set of process specifications is delivered.

6.2 Processes – Implementing and Operating

Implementing and operating the actual process include knowing stakeholder's requirements related to both process and product (*Clause 6.2.1*), acquiring infrastructure and resources, including supplier's involvement, making them suitable to the process (*Clause 6.2.2*). Once accomplished, the process is ready to run in continuous cycles with the proper elements to control the service or product provision (*Clause 6.2.3*), identifying the product through the whole process for control and improvement actions for quality or environmental requirements (*Clause 6.2.3.4*), preserving the stakeholder property, which for the IMS means minimizing negative impacts on environment, keeping social and ethical issues and the customer and supplier property (*Clause 6.2.3.5*), keeping the product or service in proper conditions for use of the stakeholder or the following process (*Clause 6.2.3.6*), properly managing hazardous materials and processes to keeping safe employees, environment, customers and related stakeholders (*Clause 6.2.3.2*) and maintaining control and measurement devices and equipment in good stand (*Clause 6.2.3.7*)

6.3 Processes - Controlling and Improving

The IMS model considers these two phases closely intertwined. For each process the IMS requires an organization to measure it against the related IMS objectives, analyzing the data and improving the process to a better achievement of results (*Clause 6.3.1)*. However, in order to meet stakeholder requirements, the IMS requires monitoring and measuring not only the process (*Clause 6.3.2*), but also the product destined either to a specific stakeholder or to another process (*Clause 6.3.3*). The process should also have procedures for addressing nonconforming product, either for customer requirements or environmental requirements (*Clause 6.3.4*). As part of the measurement and monitoring of organization's performance, the organization prepares and releases a report emphasizing social and ethical issues, (*Clause 6.3.5*).

Analysing the data from measuring and non-conformance findings result in factual and informed decisions (*Clause 6.3.6*). To obtain information assessment process must be done either focused on stakeholders or processes (*Clause 6.3.7*). From all this information, corrective, preventive and improving actions are taken (*Clause 6.3.8*).

7.0 Results

Results are, at the end, what matters most to stakeholders. Usually MSSs are designed solely focused in the processes but the IMS, to work, includes results as part of the equation. From adding results as a closing element, the IMS expects to provide factual and complete information to round up the system and truly engaging stakeholders in organization's activities. Thus, the IMS requires measuring the level of internal indicators in Q/E/OHS/CSR issues (*Clause 7.1*) and matching them with corresponding results of level of stakeholders' satisfaction, in this case, customer and employees (*Clause 7.2*). Although the IMS mentioned measurement of such results, organizations are free to select how they will do it. Balanced scorecard, performance prism and triple bottom-line are available options.

Appendix A-4
IMS Documentation and Records Requirements

Clause Nr	Requirement	Documented procedure	Record	Document
1.6	Control of documents	x		
1.7	Control of records	x		
2.4	Management review		x	
3.1	Definition of organizational values			x
3.2	Policy definition and deployment			x
3.4	Definition of organizational objectives			x
3.5	Definition of strategies			x
4.0.1	Stakeholder identification	x		
4.0.2	Stakeholder relationship			x
4.1	Stakeholder requirements			x
4.2.2	Stakeholder (supplier) evaluation		x	
4.2.3	Stakeholder communication	x		
5.2.2	Competence and training		x	
5.2.6	Information collection	x		
6.0.1	Process scope			x
6.0.2	Exclusion of process	x		
6.1.1	Planning		x	
6.1.2.1	Review of requirements related to product		x	
6.1.4	Process specific objectives			x
6.1.5	Roles, responsibilities and accountability			x
6.2.1.2	Design and development input		x	
6.2.1.4	Design and development review		x	
6.2.1.5	Design and development verification		x	
6.2.1.6	Design and development validation		x	
6.2.1.7	Design and development changes		x	
6.2.3.3	Validation of processes for production and service provision		x	
6.2.3.4	Identification and traceability		x	
6.2.3.5	Stakeholders property		x	
6.2.3.7	Control of monitoring and measuring devices		x	
6.3.2	Monitoring and measurement of process		x	
6.3.3	Monitoring and measurement of product		x	
6.3.4	Control of nonconforming product	x	x	
6.3.7	Assessment of processes	x	x	
6.3.8.2	Corrective action	x	x	
6.3.8.3	Preventive action	x	x	
7.1	Operational indicators and results	x	x	
	TOTAL	11	21	9

Appendix A-5
IMS Guidelines for Integrating Quality, Environmental, Occupational Health and Safety, and Corporate Social Responsibility Management Systems

1.0 Integrated Management System

1.1 General requirements
The organization should define, establish, document, implement and maintain an IMS and continually improve its effectiveness in accordance with the requirements of this guideline

The organization should define the scope of the IMS according to their requirements. QMS, EMS, OHSMS and CSRMS are possible management systems to be consider as components of the IMS

Where an organization chooses to outsource any process that affects conformity of product or process with IMS requirements, the organization should ensure control over such processes. Control of such outsourced processes should be identified within the IMS

1.2 Terms, Definitions and References
Terms, definitions and references used through these guidelines can be found in:

a) ISO 9000:2000
b) ISO 14001:2004
c) OHSAS 18001:1999
d) AA 1000:1999

1.3 Applicability of processes
All requirements of these guidelines are generic and are intended to be applicable to all organizations, regardless of type, size and product provided

The extent of the application will depend on such factors as the IMS scope, policies, the nature and location of its operations and the conditions in which it functions

1.4 Documentation requirements
The integrated management system documentation should include:

a) organization's mission, values, policies, objectives, targets and results
b) description of the main elements of the IMS and their interaction and reference to related documents (See 1.5)
c) documents and records required by this guideline
d) documents and records determined by the organization to be necessary to ensure the effective planning, operation and control of processes that relate to its IMS

1.5 IMS manual
The organization should establish and maintain an IMS manual that describes:

a) the scope of the IMS, including details of and justification for any exclusions (See 6.0.2)
b) the documented procedures established for the IMS, or reference to them,
c) a description of the interaction between the processes of the IMS
d) a description of the indicators to measure IMS results

1.6 Control of Documents
Documents required by the IMS should be controlled. A documented procedure should be established to define the controls needed:

a) to approve documents for adequacy prior to issue,
b) to review and update as necessary and re-approve documents,
c) to ensure that changes and the current revision status of documents are identified,
d) to ensure that relevant versions of applicable documents are available at points of use,

e) to ensure that documents remain legible and readily identifiable,
f) to ensure that documents of external origin are identified and their distribution controlled,
g) to prevent the unintended use of obsolete documents, and to apply suitable identification to them if they are retained for any purpose

1.7 Control of Records

The organization should establish and maintain records as necessary to demonstrate conformity and the extent of performance to the requirements of its IMS and of these guidelines. Records should include results on IMS indicators and evaluation of compliance with applicable IMS requirements.

The organization should establish and maintain documented procedures for the identification, storage, protection, retrieval, retention and disposal of records

Records should be and remain legible, identifiable and traceable

2.0 Leadership

2.1 Leadership system

The governing body of the organization (e.g. its board and top management) is ultimately responsible for the conduct of the system process. The individual processes or subsystems may, however, be performed by a variety of members of the organization and by external advisers and auditors.

The planning of the IMS should be carried out by top management in order to meet the requirements of the stakeholders and the IMS. The integrity of the IMS should be maintained by top management when changes to the IMS are planned and implemented.

Top management should measure the performance of the IMS and involve stakeholders in the improvement of those integrated results.

2.2 Stakeholder focus

Stakeholder requirements should be determined and deployed into the organization, according to the integrated management system scope, with the aim to enhancing stakeholders' satisfaction (See 6.1.2, 6.1.3, 7.1 and 7.2)

Top management should involve stakeholders in the IMS by defining their role in the system, including at the planning stage, which should be clearly communicated to them.

2.3 Management commitment

Top management should commit to the development and implementation of the IMS and involvement of stakeholders within this process. They should define governance procedures to ensure the inclusion of stakeholders where required by the IMS and related processes. Management commitment should be exerted by:

a) communicating to the organization the importance of meeting stakeholder requirements, voluntary and legal, including reporting upon stakeholder feedback and addressing the comments in following cycles of the process
b) establishing organizational principles
c) establishing IMS policies and deploying them into objectives (See 3.2 and 3.4)
d) establishing their roles and responsibilities, including implementing values throughout the organization
e) establishing core operating processes in consideration of the organization's values, objectives and targets. These may include, but are not limited to, the organization's strategic planning, budgeting and investment planning processes
f) incorporating, if required, best practices in a code of conduct
g) establishing an integral performance measurement system

h) conducting management reviews
i) ensuring the availability of resources

A member of top management should be named as IMS management representative to coordinate the activities of the IMS committee including:

a) establish, implement and maintain processes needed for the IMS
b) report to stakeholders on the performance of the IMS and any need for improvement

2.3 Management review

Top management should review the organization's IMS, at planned intervals, to ensure its continuing suitability, adequacy and effectiveness. This review should include assessing opportunities for improvement and the need for changes to the IMS, including

a) its policy and objectives,
b) results of assessments/audits of IMS and particular subsystems,
c) communication with external interested parties,
d) performance of the IMS (results),
e) status of corrective and preventive actions,
f) follow-up of actions from previous management reviews,
g) changing circumstances,
h) recommendations for improvement,
i) improvement of the effectiveness of the IMS and its elements processes,
j) improvement of product and processes results related to stakeholders customer requirements,
k) resource needs and integration of stakeholders

Records from management reviews should be maintained (See 1.7)

3.0 Values and Objectives

3.1 Definition of organizational values

Top management should develop, examine and document organizational values on an on-going (regular and timely) basis with a close participation of stakeholders. The organization's mission should reflect such values.

The organization's mission and values should provide a framework for the IMS as basis for objectives and operations of the system and they should be available to all stakeholders according to their requirements.

3.2 Policy definition and deployment

There should be an **integrated** policy defined and authorized by the organization's top management, that clearly states overall organizational and stakeholder objectives and a commitment to improving IMS performance

The integrated policy should be appropriate to the nature and scale of organization's activities, products and services as well as their potential impact to stakeholders. The policy should:

a) include a commitment to comply with requirements and continually improve the effectiveness of the IMS
b) include a commitment to at least comply with current applicable legislation (set in the IMS scope)
c) provide a framework for establishing and reviewing IMS and functional specific objectives
d) be communicated, documented, implemented, understood, maintained and reviewed for suitability within the organization
e) be communicated to all persons working for or on behalf of the organization and other interested parties
f) be made available to the public

3.3 Organizational Culture - Communication and Accountability

Top management should establish and maintain procedures for internal communication throughout the organization, employee involvement and consultation. Such procedures should be based on values and policies (See 3.1 and 3.2)

The organization should establish shared lines of communication with external stakeholders, encouraging their integration as part of the organizational culture (See 4.0.2)

3.4 Definition of organizational objectives

Top management should establish and maintain documented objectives and targets, at relevant functions and levels within the organization for both processes and product(s)

The objectives and targets should be measurable where practicable and consistent with the IMS and functional policies to include compliance with legal and other requirements as set in the IMS. Environmental, health and safety, quality, and social issues should be considered as a consistent set avoiding possible conflicts of interest (See 4.1.1).

The objectives should include the commitment of the organization to continual improvement.

3.5 Identification and deployment of strategies

Top management should establish and document strategies for achieving its organizational objectives and targets. It should include:

a) designation of responsibility for achieving objectives and targets at relevant functions and levels of the organization (See 6.1.5)
b) the means and time-scale by which objectives are to be achieved (See 6.1)

The IMS and functional strategies should be reviewed at regular and planned intervals and, where necessary, amended to address change to the activities, products, services, or operating conditions of the organization (See 2.4)

4.0 Stakeholders

4.0.1 Stakeholder identification

The organization should identify its stakeholders and characterize its relationship with them within the scope of the IMS. If required, the organization may group stakeholders according to its needs.

The organization should establish, maintain and review documented procedures to identify the stakeholders involved within the IMS scope, including organization activities, products and services

NOTE 1: Stakeholders are defined as those parties or groups of individuals who affect and / or are affected by an organization or its activities.

NOTE 2: *The stakeholder for the IMS may include, but are not limited to: owners, trustees, employees (e.g. managers, staff and trade unions), customers, members (e.g. of cooperative, mutual or friendly societies), suppliers, environment, and other partners, competitors, government and regulators, the electorate (e.g. for public sector bodies), NGO or not for profit organizations, pressure groups and influencers, and local and international communities*

4.0.2 Stakeholder integration

The on-going process of stakeholder integration should assist the IMS on the examination and / or revision of its stated relationship with each stakeholder group. This relationship should be documented

Where possible, the organization should consult stakeholders on the development of objectives, targets and indicators for measuring performance of the IMS cycles.

NOTE: The techniques adopted to involve stakeholders in organization's performance vary depending on the organization and the scope of the integration.

4.1 Stakeholder requirements

4.1.1 General

The organization should identify and document the stakeholders' requirements helped by a close participation from such stakeholders. This participation may vary from stakeholder and in time

The organization should be guided by its principles and values (See 3.1) in the process of identifying stakeholders' requirements.

NOTE: *The issues may reflect broad themes important to the organization and its stakeholders, or may be narrowly defined. They may be drawn from the following categories, but are not limited to them:*

a) *operational practices and processes*
b) *products and services*
c) *impact on environment, health and safety of employees and other parties at the workplace*
d) *the organization's values and governance*
e) *regulation and controls*
f) *its marketing*
g) *its accountability*
h) *human rights issues*
i) *labor and working conditions*
j) *the organization's supply chain*
k) *and investment impact*

The requirements should be examined to assess the likely impact of the organization's activities on the organization and its stakeholders. Policies, objectives and targets of the IMS are set according to an integrated approach of this set of requirements

The methodology for identification of stakeholder requirements should:

a) be defined with respect to its scope, nature and timing to ensure it is proactive rather than reactive
b) provide for the classification of risks and identification of those that are to be eliminated or controlled by measures as defined in 3.4 and 3.5
c) be consistent with operating experience and the capabilities of risk control measures employed
d) provide input into the determination of facility requirements, identification of training needs and/or development of operational controls
e) provide for the monitoring of required actions to ensure both the effectiveness and timeliness of their implementation

4.1.2 Accountability

The organization should establish procedures for ensuring that pertinent IMS information, including when applicable a social and ethical report, is exchanged to and from stakeholders considered within the IMS scope

NOTE 1: Information may include but are not limited to: product information, enquiries, contracts or order handling, including amendments, customer feedback including customer complaints, environmental impacts, health and safety hazards, labor rights, human rights, governance social and ethical requirements.

*NOTE 2: **For social and ethical issues (including environmental and health and safety aspects)**, a special report is expected from the organization (written or verbal communication) relating to* *the process undertaken in a specified period. The report(s) clearly and minimizing bias should explain the process and demonstrate how the organization's performance relates to its values, objectives and targets. It should include information about its performance measured against its key social and ethical performance targets. The organization should also provide comparative information for previous period(s) to help stakeholders understand the current performance in the context of prior period trends and in the context of external benchmarks, if available.(See Clause 6.3.5. for more information)*

4.1.3 Identification of requirements related to product(s)

The organization should identify the likely impact of its products, byproducts (including waste, emissions), and services to stakeholders within the scope of the IMS. The range of products should take into account planned or new development or modifications on them.

Requirements related to the product may include but not limited to:

a) those requirements specified by the customer, including the requirements for delivery and post-delivery activities
b) those not stated by them but necessary for specified use or known and intended use
c) statutory and regulatory requirements related to the product (including environmental aspects)
d) any additional requirements determined by the organization

4.1.4 Identification of requirements related to process(es)

The organization should identify the likely impact of its process(es) to stakeholders considered within the scope of the IMS. These process requirements should take into account planned or new development or modifications on them (See 6.1.2).

Requirements may include but not limited to:

a) ongoing identification of environmental and health and safety hazards
b) assessment of risks of environmental and health and safety hazards
c) implementation of necessary control measures
d) environmental aspects
e) product information, enquiries, contracts or order handling, amendments
f) customer feedback and customer complaints
g) social and ethical requirements

Health and safety hazards should be defined to include routine and non-routine activities, activities of all personnel having access to the workplace (including subcontractors and visitors), and facilities at the workplace whether provided by the organization or others.

4.2 Stakeholder Provision

4.2.1 General

For each stakeholder group, the organization should describe its relationship with them, including its role as providers to the organization and the IMS. The dimensions of the relationships will differ for each stakeholder group, and may vary over time.

The on-going process of stakeholder integration should assist the organization in the examination of stakeholders as system providers.

4.2.2 Partnership

The organization should evaluate and select, when possible, stakeholders based on their ability to supply resources in accordance with the organization's requirements. Criteria for such selection, evaluation and re-evaluation should be established.

Records of the results of evaluations and any necessary actions arising from the evaluation should be maintained (See 1.7).

Where the organization intends to perform verification at the supplier's premises, the organization should state the intended verification arrangements and method of product release in the purchasing information

Partnership with internal stakeholders should include managing its work environment by taking care of social, environmental and safety issues (See 5.2.4).

4.2.3 Communication

The organization should establish and maintain procedures for ensuring that material, inclusive and complete information of stakeholders necessary for IMS operations is received from employees and other interested parties.

Stakeholders' involvement and consultation procedures should be documented.

4.2.4 Planning involvement

Selected stakeholders should be involved in the development and review of policies, objectives and procedures to manage IMS processes. A broad range of methods may be used to involve stakeholders for planning of the system.

4.2.5 Resource provision

The organization should determine and integrate required stakeholders to provide resources needed to implement and maintain the IMS and continually improve its effectiveness to enhance stakeholder satisfaction when meeting their requirements.

5.0 Resources

5.1 Provision of resources

Management should provide resources essential to the implementation, control and improvement of the IMS to enhance stakeholder satisfaction

5.2 Human resources

5.2.1 Human resource management

Personnel performing work affecting stakeholders or involved in processes directed to meet their requirements should be competent on the basis of appropriate education, training, skills and experience.

5.2.2 Competence and training

The organization should:

a) ensure that any person performing tasks or on its behalf that have the potential to cause a significant impact on any IMS operation is competent on the basis of appropriate education, training, or experience
b) identify and provide training associated with IMS requirements
c) evaluate the effectiveness of the actions taken
d) maintain appropriate records of education, training, skills and experience (See 1.7)

Training procedures should take into account different levels of responsibility, ability, literacy and risk

5.2.3 Involvement of personnel

The organization should involve personnel by:

a) defining procedures to make persons working for it or on its behalf aware of the importance of conformity with the IMS or functional policies, requirements and procedures,

b) communicating the significant impacts, actual or potential, of their work in meeting stakeholders requirements as well as the benefits of improved personal performance (environmental, social and economical)
c) establishing their roles and responsibilities including those for emergency preparedness and response requirements (6.2.3.2).
d) making them aware of the potential consequences of departure from specified operating procedures

NOTE: Some methods to obtain such involvement are:
a) incorporate the organization's values in employee hiring, job descriptions and reviews
b) reward and sanction procedures related to social and ethical behavior and performance.
c) create mechanisms to allow employees to address conflicts of interest or ethical dilemmas
d) recourse mechanisms for employees and partners such as confidential help-lines and other whistle-blowing mechanisms
e) ensure that employees and other relevant stakeholders are aware of and understand the IMS elements

5.2.4 Maintenance of human resources (OHS/E/CSR)

The organization should determine and manage the work environment, including environmental and health and safety aspects, needed to perform its operations

5.3 Infrastructure

The organization should determine, provide and maintain the infrastructure needed to achieve IMS requirements. Infrastructure may include but not limited to:
a) buildings, workspace and associated utilities
b) process equipment, both hardware and software
c) supporting services such as transport or communication

5.4 Information

Information about the IMS performance should be gathered from both internal information system and communication with stakeholders. Information should be complete, inclusive and material to help in the decision making process.

NOTE 1: A variety of methods of communication with stakeholders may be used by the organization. Among them are:
a) marketing surveys
b) industry or sector specific studies
c) review of legal requirements
d) one-to-one interviews, face-to-face and distance
e) group interviews
f) focus groups
g) workshops and seminars
h) public meetings
i) questionnaires – face-to-face, by letter, telephone, internet, or other techniques

NOTE 2: The methods adopted to communicate with stakeholders vary depending on the nature and size of the organization and the scope of the process – the stakeholders included, the complexity and nature of the issues covered and the geographic location.

NOTE 3: The organization may use sampling techniques for its data collection processes. The samples are robust, and ensure that a representative spread of each stakeholder category within the process scope is included. In defining samples, the organization is aware of key diversity issues, which may include but are not limited to: the gender, race, age, disabilities and culture of the samples.

The organization should select methods for obtaining information in terms of availability of financial resources, staff resources and management systems and by the capacity of its stakeholders

Regardless of the method chosen, the stakeholders should be encouraged and helped to understand the process and to provide information. The organization should also involve stakeholders in the design of the questions to be addressed in the processes of information gathering

A documented procedure for data collection should be elaborated to enable internal and external auditing of their appropriateness. For the audit of stakeholder integration processes, the organization should allow the auditor to examine documentation and to attend dialogues, unless this raises conflict with other principles of accountability or issues of sensitivity for stakeholders. These conflicts should be discussed with the auditor.

6.0 Identification of Processes

6.0.1 Scope of processes

The organization should determine and document the scope of the processes in terms of the stakeholders, stakeholder requirements, geographical locations and operating units to be included. When determining the scope of the processes, the organization should consider their inclusivity, completeness and materiality.

The organization should

a) determine the sequence and interaction of these processes
b) determine criteria and methods needed to ensure that both the operation and control of these processes are effective
c) ensure availability of resources and information necessary to support the operation and monitoring of these processes
d) monitor, measure and analyze these processes
e) implement actions necessary to achieve planned results and continual improvement of these processes

Each cycle of the process should be completed on a regular and timely basis. If a specific timing process does not match other cycles, the rationale for the time period chosen should be documented to allow internal and external auditing.

6.0.2 Exclusion of stakeholders in processes

The organization is accountable to all its stakeholder groups, and for its activities in all geographic locations and operating units. However, for reasons of time or financial constraints, the organization may choose not to include all stakeholders, locations or operations in the IMS scope in any cycle of the process.

The organization should document and communicate the selection criteria for such exclusions together with a list of excluded stakeholders, locations and units, and plans for future inclusion in the process

If the organization has subsidiaries or joint ventures being excluded this fact should be documented and communicated about the material impact on the understanding of the organization's overall activities.

6.1 Process Planning

6.1.1 Planning

The organization should plan and develop the processes needed for product realization and supporting process. Planning of these processes should be consistent with the organizational objectives (See 3.4) and requirements of other processes.

The organization should determine as appropriate:

a) the need to establish processes, documents, and resources specific to the product and process
b) required verification, validation, monitoring, inspection and test activities specific to the product and the criteria for product acceptance
c) records needed to provide evidence that the realization processes and resulting product fulfill requirements should be determined (See 1.7)

The output of this planning should be in a form suitable for the organization's method of operations

NOTE 1: A document specifying the processes of the integrated management system (including the product realization processes) and the resources to be applied to a specific product, project or contract can be referred to as an integrated plan.

NOTE 2: The organization may also apply the requirements given in 6.2.1 to the development of product realization processes.

6.1.2 Legal and other requirements related to product(s)

The organization should establish and maintain procedures to identify and have access to statutory requirements and other voluntary agreements related to the product(s) including contractual, environmental and social aspects (See 4.1.3).

The organization should ensure that contractual, environmental, social and other legal requirements to which the organization subscribes are considered in developing, implementing and delivering the product(s)

The organization should keep this information up-to-date. It should communicate relevant information on legal and other requirements to its employees and other relevant parties

6.1.2.1 Review of requirements related to product(s)

This review should be conducted prior to the organization's commitment to supply a product to the customer (e.g. submission of tenders, acceptance of contracts or orders, acceptance of changes to contracts or orders) and shall ensure:

a) product requirements are defined
b) contract or order requirements differing from those previously expressed are resolved
c) the organization has the ability to meet the defined requirements

Records of the results of the review and actions arising from the review shall be maintained (See 1.7)

Where the customer provides no documented statement of requirement, the customer requirements should be confirmed by the organization before acceptance

Where product requirements are changed the organization should ensure that relevant documents are amended and that relevant personnel are made aware of the changed requirements

6.1.3 Legal and other requirements related to process(es)

The organization should establish and maintain procedures to identify and have access to statutory requirements and other voluntary agreements related to the process(es) including contractual, environmental and social aspects.

The organization should ensure that contractual, environmental, social and other requirements to which the organization subscribes are considered in developing, implementing and maintaining processes

The organization should keep this information up-to-date. It should communicate relevant information on legal and other requirements to its employees and other relevant parties

The organization should prepare and release a social and ethical report that reflects the social and ethical performance of the organization relating to its values, objectives and targets (See 6.3.5)

6.1.4 Process specific objectives

The organization should ensure that IMS processes objectives, including those needed to meet requirements for product, are established and documented at relevant functions and levels within the organization. The processes objectives should be measurable, including means, time-frame and consistency with the organizational objectives.

When establishing and reviewing its objectives and targets for processes, an organization should consider:

a) the IMS general objectives
b) policies and legal and other functional requirements
c) technological options
d) financial, operational and business requirements

6.1.5 Responsibility, authority and accountability

The organization should ensure that the responsibilities, authorities and accountabilities for all IMS process are defined, communicated and documented within the organization.

For social and ethical issues, the organization is accountable and responsible to prepare a social and ethical report. This report should include information about its performance measured against its key social and ethical performance targets.

6.2 Implementing and Operating

6.2.1 Design and development

6.2.1.1 Functional aspects in designing product

The organization should plan and control the design and development of product to incorporate quality, environmental, health and safety, and social requirements in both the product itself and the process to produce it

During the design and development planning, the organization should determine

a) the design and development stages
b) the review, verification and validation that are appropriate to each design and development stage
c) the responsibilities and authorities for design and development

The organization should manage the interfaces between different groups, including environmental and social representatives, involved in design and development to ensure effective communication and clear assignment of responsibility
Planning output should be updated, as appropriate, as the design and development progresses

6.2.1.2 Design and development inputs

Inputs relating to product requirements should be determined and records maintained (See 1.7). These inputs may include but no limited to:

a) functional and performance requirements
b) applicable statutory and regulatory requirements including social and environmental aspects
c) where applicable, information derived from previous similar designs
d) other requirements essential for design and development

These inputs should be reviewed for adequacy. Requirements should be complete, unambiguous and not in conflict with each other

6.2.1.3 Design and development outputs

The outputs of design and development should be provided in a form that enables verification against the design and development input and should be approved prior to release.

The outputs of design should

a) meet the input requirements for design and development
b) provide appropriate information for relevant IMS requirements, including environmental, health and safety and social
c) provide appropriate information for purchasing, production and for service provision
d) contain or reference product acceptance criteria
e) specify the characteristics of the product that are essential for its safe and proper use

6.2.1.4 Design and development review

At suitable stages, systematic reviews of design and development should be conducted

a) to evaluate the ability of the results of design and development to fulfill requirements
b) to identify any problems and propose necessary actions

Participants in such reviews should include representatives of functions (including those of environment, health and safety, quality and social responsibility) concerned with the design and development stages being reviewed. Records of the results of the reviews and any necessary actions should be maintained (See 1.7).

6.2.1.5 Design and development verification

Verification should be performed to ensure that the design and development outputs have satisfied the design and development input requirements. Records of the results of the verification and any necessary actions should be maintained (See 1.7).

6.2.1.6 Design and development validation

Design and development validation should be performed in accordance with planned arrangements to ensure that the resulting product is capable of fulfilling the requirements for the specified or known intended use or application (See 6.2.1.1).

Wherever practicable, validation should be completed prior to the delivery or implementation of the product. Records of the results of validation and any necessary actions should be maintained (See 1.7).

6.2.1.7 Design and development changes

Design and development changes should be identified and records maintained. The changes should be reviewed, verified and validated, as appropriate, and approved before implementation. The review of design and development changes should include evaluation of the effect of the changes on constituent parts and delivered product

Records of the results of the reviews of changes and any necessary actions should be maintained (See 1.7).

6.2.2 Purchasing

The organization should ensure that purchased product conforms to specified purchase requirements. The type and extent of control applied to the supplier and the purchased product should be dependent upon the effect of the purchased product on subsequent product realization or the final product

The organization should evaluate and select suppliers based on their ability to supply product in accordance with the organization's requirements. Criteria for selection, evaluation and re-evaluation should be established to include issues of social and environmental conformance as indicated by organization's policy.

6.2.2.1 Supplier's involvement

The organization should ensure that key suppliers are considered in the design of product and corresponding processes to include their health and safety at the workplace (See 4.2.2)

6.2.2.2 Purchasing Information

Purchasing information should describe the product to be purchased, including where appropriate:

a) requirements for approval of product, procedures, processes and equipment
b) requirements for qualification of personnel
c) applicable IMS requirements

The organization should ensure the adequacy of specified purchase requirements prior to their communication to the supplier

6.2.2.3 Control of purchased product

The organization should establish and implement the inspection or other activities necessary for ensuring that purchased product meets specified purchase requirements

Where the organization or its customer intends to perform verification at the supplier's premises, the organization should state the intended verification arrangements and method of product release in the purchasing information

6.2.3 Product and services provision

6.2.3.1 Control of product and services provision

The organization should plan and carry out production and service provision processes under controlled conditions. These conditions should comply with identified IMS and functional policies and should include:

a) availability of information that describes the characteristics of the product
b) availability of work instructions
c) use of procedures to control situations where absence of documented procedures could lead to deviations from the IMS policy and objectives (environmental aspects, health and safety risks and social issues)
d) availability of mechanisms that address ethical dilemmas and that offer recourse to sanctions easily accessible
e) the use of suitable equipment
f) the availability and use of monitoring and measuring devices
g) the implementation of monitoring and measurement
h) the implementation of release, delivery and post-delivery activities

6.2.3.2 Functional Emergency preparedness and response

The organization should establish an maintain procedure to

a) identify potential emergency situations and potential emergencies (accidents that can have impacts on the environment or incidents that will likely result in illness and injury of employee or visitors), and how it will respond to them
b) respond to actual emergency situations and accidents and prevent or mitigate associated environmental or health and safety impacts

The organization should periodically review and, where necessary, revise its emergency preparedness and response procedures, in particular after the occurrence of accidents or emergency situations

The organization should also periodically test such procedures where practicable

6.2.3.3 Validation of processes for production and service provision

The organization should validate any processes for production and service provision where the resulting output cannot be verified by subsequent monitoring or measurement. This includes any processes where deficiencies become apparent only after the product is in use or the service has been delivered

Validation should demonstrate the ability of these processes to achieve planned results. The organization should establish arrangements as applicable:

a) defined criteria for review and approval of the processes
b) approval of equipment and qualification of personnel
c) use of specific methods and procedures
d) requirements for records (See 1.7)
e) and revalidation

6.2.3.4 Identification and traceability

Where appropriate, the organization should identify the product by suitable means throughout product realization

The organization should identify the product status with respect to monitoring and measurement requirements

Where traceability is a requirement, the organization should control and record the unique identification of the product (See 1.7)

6.2.3.5 Stakeholders property

The organization should exercise care with stakeholder property (including intellectual property) while it is under the organization's control or being used by the organization. The organization should identify, verify, protect and safeguard stakeholder property provided for use or incorporation into the product. If any stakeholder property is lost, damaged or otherwise found to be unsuitable for use, this should be reported to the stakeholder and records maintained (See 1.7)

6.2.3.6 Preservation of product

The organization should preserve the conformity of product during internal processing and delivery to the intended destination. This preservation should include identification, handling, packaging, storage and protection. Preservation should also apply to the constituent parts of a product.

6.2.3.7 Control of monitoring and measuring devices

The organization should determine the monitoring and measuring devices needed to provide evidence of conformity to product to determined requirements (See 6.1.2) and processes to determined performance (6.1.3).

The organization should establish processes to ensure that monitoring and measurement can be carried out and are carried out in a manner that is consistent with the monitoring and measurement requirements

Measurement equipment should:

a) be calibrated or verified at specified intervals, or prior to use, against measurement standards traceable to international or national measurement standards; where no such standards exist, the basis used for calibration and verification should be recorded
b) be adjusted or re-adjusted as necessary
c) be identified to enable the calibration status to be determined
d) be safeguarded from adjustments than would invalidate the measurement result
e) be protected from damage and deterioration during handling, maintenance and storage

In addition, the organization should assess and record the validity of the previous measuring results when the equipment is found not to conform to requirements. The organization should take appropriate action on the equipment and any product affected. Records of the results of calibration and verification should be maintained (See 1.7)

When used in the monitoring and measurement of specified requirements, the ability of computer software to satisfy the intended application should be confirmed. This should be undertaken prior to initial use and reconfirmed as necessary

6.3 Controlling and Improving

6.3.1 Measuring, analysis and improvement processes

The organization should plan and implement, in a regular basis, the monitoring, measurement, analysis and improvement processes needed

a) to demonstrate conformity of the product
b) to ensure conformity of the IMS
c) to continually improve the effectiveness of the IMS

This should include determination of applicable methods, including statistical techniques and the extent of their use

6.3.2 Monitoring and measurement of processes

The organization should apply suitable methods for monitoring and, where applicable, measuring the IMS processes in terms of its impact on environmental, health and safety, quality, and social requirements. These methods should demonstrate the ability of the processes to achieve planned results (See 6.1.3). When planned results are not achieved, correction and corrective action should be taken, as appropriate, to ensure conformity of the product and by-products

Records of data and results of monitoring and measurement should be kept to facilitate subsequent corrective and preventive action analysis (See 1.7)

6.3.3 Monitoring and measurement of product

The organization should monitor and measure the characteristics of the product to verify that product requirements are fulfilled. This should be carried out at appropriate stages of the product realization process inn accordance with the planned arrangements (See 6.1)

Evidence of conformity with the acceptance criteria should be maintained. Records should indicate the person authorizing release of product (See 1.7)

Product release and service delivery should not proceed until all the planned arrangements have been satisfactorily completed, unless otherwise approved by a relevant authority, and where applicable by the customer

6.3.4 Control of non conforming product

The organization should ensure that product which does not conform to product requirements is identified and controlled to prevent its unintended use or delivery. The controls and related responsibilities and authorities for dealing with nonconforming product should be defined in a documented procedure that may include:

a) taking action to eliminate the detected nonconformity
b) authorizing its use, release or acceptance under concession by a relevant authority and, where applicable, by the customer
c) taking action to preclude its original intended use or application

Records of the nature of nonconformities and any subsequent actions taken, including concessions obtained, should be maintained (See 1.7)

When nonconforming product is corrected it should be subject to re-verification to demonstrate conformity to the requirements

When nonconforming product is detected after delivery or use has started, the organization should take action appropriate to the effects, or potential effects of the nonconformity

6.3.5 Report for social and ethical issues

The organization should prepare a social and ethical report (written or verbal communication) or reports relating to the process undertaken in a specified period. The report(s) clearly and minimizing bias should explain the process and demonstrate how the organization's performance relates to its values, objectives and targets. It should include information about its performance measured against its key social and ethical performance targets. The organization should provide comparative information for previous period(s) to help stakeholders understand the current performance in the context of prior period trends and in the context of external benchmarks, if available.

The report(s) should also include:

a) Descriptive information, including a statement of the organization:

- i. Mission and values (See 3.1)
- ii. Governance procedures including the role of stakeholders (See 4.0.1)
- iii. Structures and processes for dealing with social and ethical issues (See 6.0)
- iv. Methodology adopted for process, including the scope of the exercise and the reasons for the exclusion of any activities, locations, stakeholders or issues from the process cycle (See 6.0.2)
- v. Plans for future cycles of the process (See 6.0.2).

b) Performance information, which includes information on the organization's performance against the
three tiers of indicators identified (See 7.1). This includes:

- i. Information on the organization's performance against its mission and values, and information on its performance against standards, codes and guidelines to which it subscribes.
- ii. Information on stakeholder identified indicators (including stakeholder commentary on the organization's performance in relation to stakeholder values) for the current cycle and also comparative data for previous periods of account, if appropriate
- iii. Information reflecting societal benchmarks - these include indicators for the organization's performance against legal requirements for performance and disclosure

NOTES:

The content of the report reflects the AA1000 principles, and is inclusive, complete, material, comparable, reliable, relevant and understandable. In defining the structure of the social and ethical report the organization is guided by the principles of information quality.
The organization may produce more than one social and ethical report (in any accounting period) to address the information needs of different stakeholder groups. Where more than one social and ethical report is produced, each report should clearly indicate its relationship to the other social and ethical reports produced by the organization for relevant accounting period(s).

If the organization has completed a cycle of the process previously, including a social and ethical report(s), it engages with its stakeholders on the structure, format and content of the social and ethical report(s) being written.

The social and ethical report(s) make clear where issues and indicators are outside the power of influence of the organization, or where the organization is operating in partnership (See 6.0.2) to affect the indicators

The social and ethical report(s) may also include:

a) Stakeholder commentary on the organization's selection of issues, indicators and social and ethical auditor(s)
b) Commentary attributed to specific stakeholders on. the organization's performance against its values and on salient issues relating to the interplay between the organization and the stakeholder group
c) An indication of links between the IMS with financial and environmental information. The statement should seek, where possible, to integrate information on social and ethical performance with environmental and financial performance data where this enables a better understanding of the particular issues or the organization's decision-making processes.

Depending on the information being reported, it may be appropriate for the organization to provide comparative information for more than one previous period, so that its performance over time can be judged. Where comparative information is not available, the reasons for this are clearly explained in the report.
The organization communicates information on the process and social and ethical performance of the organization to all stakeholder groups. This includes making accessible to all stakeholder groups the social and ethical report(s) together with the independent audit opinion(s). The organization actively seeks feedback from its stakeholder groups in order to further develop its process.

The report(s) also form part of the integrative process with stakeholders. Stakeholder feedback on the report(s) is facilitated by the organization. To address the principle of continuous improvement, the feedback includes consideration of methods to improve the organization's process as well as its social and ethical performance.

The report(s) and other communications should be logically structured and written and / or presented in a manner understandable to all stakeholder groups, although individual communications ay be targeted to specific stakeholder groups. Understandability includes issues of language, style and format. Technical and scientific terms are explained within the report.

6.3.6 Analysis of Data

The organization should determine, collect and analyze appropriate data to demonstrate the suitability and effectiveness of the IMS and to evaluate where continual improvement to the IMS can be made. This should include data generated as a result of monitoring and measurement and from results (See 7.0) including:

a) stakeholder satisfaction (See 7.2.1 and 7.2.2)
b) conformance to product requirements (See 6.1.2)
c) characteristics and trends of processes and products including opportunities for preventive action
d) suppliers
e) environmental and social requirements

6.3.7 Assessment Processes

The organization should establish and maintain an audit program and procedures for periodic IMS and / or functional specific (when required) audits to be carried out, in order to determine whether or not the IMS or a subsystem (See 6.1)

a) conforms to the planned arrangements to the requirements of the IMS and of this set of guidelines, including integration of the system elements
b) has been properly implemented and is maintained and is effective in meeting the organization's IMS values, policies and objectives
c) review the results of previous audits, provide information on the results of audits to management

An audit program should be planned, taking into consideration the status and importance of the processes and areas to be audited, as well as the results of previous audits. The audit criteria, scope, frequency and methods should be defined. Selection of auditors and conduct of audits should ensure objectivity and impartiality of the audit process. Auditors should not audit their own work

The responsibilities and requirements for planning and conducting audits, and for reporting results and maintaining records (See 1.7) should be defined in a documented procedure

The management responsible for the area being audited should ensure that actions are taken without undue delay to eliminate detected nonconformities and their causes. Follow up activities should include the verification of the actions taken and the reporting of verification results (See 6.3.9.2)

6.3.8 Control and improvement

6.3.8.1 Continual improvement

The organization should continually improve the effectiveness of the IMS through the use of the integrated policies, objectives, assessment results, analysis of data, corrective and preventive actions and management review

6.3.8.2 Corrective action

The organization should take action to eliminate the cause of nonconformities in order to prevent recurrence. Corrective actions should be appropriate to the effects of the nonconformities encountered

A documented procedure should be established to define requirements for:

a) reviewing nonconformities (including stakeholder feedback and accountability)
b) determining the causes of nonconformities
c) evaluating the need for action to ensure that nonconformities do not recur
d) determining and implementing action needed
e) records of the results of action taken (See 1.7)
f) reviewing corrective action taken

6.3.8.3 Preventive action

The organization should determine action to eliminate the causes of potential nonconformities in order to prevent their occurrence. Preventive actions should be appropriate to the effects of the potential problems

A documented procedure should be established to define requirements for:

a) determining potential nonconformities and their causes
b) evaluating the need for action to prevent occurrence of nonconformities
c) determining and implementing action needed
d) records of the results of action taken (See 1.7)
e) reviewing preventive action taken

7.0 Results

7.1 Operational indicators and results

The organization should establish and maintain documented procedures for periodically evaluating compliance with applicable contractual, environmental, health and safety and social and ethical legal requirements and others to which the organization subscribes to meet the organization's commitment to compliance

Indicators should measure the extent to achievement of the objectives set in 3.4 and Clause 6.1.4, process planning.

The organization's choice of indicators to measure performance on IMS issues should be based on the principles of inclusivity, completeness, materiality and information quality (comparability, reliability, relevance and understandability).

Indicators selected should provide sufficient coverage of the defined scope of the process within the IMS scope including stakeholders, geographies, operations and issues.

These results should be recorded, analyzed and provided to management as input for management review and setting of objectives (See 1.7)

NOTE: Indicators may be selected individually or as a group to address a specific issue. The rationale and processes of identifying indicators for the IMS are documented to support internal and external auditing.

7.1.1 Quality Results

The organization should determine, establish, maintain and improve indicators to measure its performance on key quality issues (cycle time and response, effectiveness on use of resources, defect level, product performance)

7.1.2 Environmental Results

The organization should determine, establish, maintain and improve indicators to measure its performance on key environmental aspects (emission of particles, use of land, impact on wildlife, final disposal of product, recycling and others)

7.1.3 Social Results

The organization should determine, establish, maintain and improve indicators to measure its performance on key social aspects including occupational health and safety (incident and quasi-incident rates, illness and injury rates, human rights, ethical code breaches, participation on community development, and others)

NOTE: *The organization's choice of indicators may reflect a three-tier approach covering its values, the values of its stakeholders and wider societal values.*

- *a) The first tier of values to be reflected in the indicators is based on the organization's statement of mission and values, and the standards, codes and guidelines to which the organization subscribes.*
- *b) The choice of indicators also reflects stakeholders' views of the organization's performance against its values and in respect of the specific needs and aspirations of stakeholders. Stakeholder views are obtained through an inclusive process of stakeholder integration. Following the initial definition of indicators, the organization will refine these and reconcile conflicting opinions through further communication with stakeholders.*
- *c) The third tier of values reflected in the indicators is based on benchmarks established in societies that are part of the process scope. These may be evident in legal statute or from the evidence of stakeholders. The organization includes indicators for its performance against its legal requirements for performance and disclosure.*

Within these tiers, the organization selects indicators that reflect both its processes and the outcomes of its activities. Outcomes may include the output of an activity, and/or its impact.

The second and third tiers of values, the organization may choose not to pursue the measurement of all the indicators identified by stakeholders. Indicators may be suggested for issues outside the direct or indirect power of influence of the organization; the number and nature of the indicators may exceed resource boundaries; and the number of indicators may weaken the clarity of communication. Where the organization limits the number of indicators suggested by stakeholders, it engages stakeholders in a process of prioritization.

7.2 Stakeholders Satisfaction Results

7.2.1 Customer satisfaction

As one of the measurements of the performance of the IMS, the organization should monitor information relating to customer perception as to whether the organization has fulfilled customer requirements. The methods for obtaining and using this information should be determined

Some indicators that can be used to measure the satisfaction of the customer are:

a) customer satisfaction
b) customer retention
c) customer recognition
d) customer dissatisfaction
e) complaints
f) returns
g) claims
h) warranty works

7.2.2 Employee satisfaction

As one of the measurements of the performance of the IMS, the organization should monitor information relating to employee perception as to whether the organization has fulfilled their requirements. The methods for obtaining and using this information should be determined.

Appendix B-1
Validation of the IMS Model

1.0 Introduction

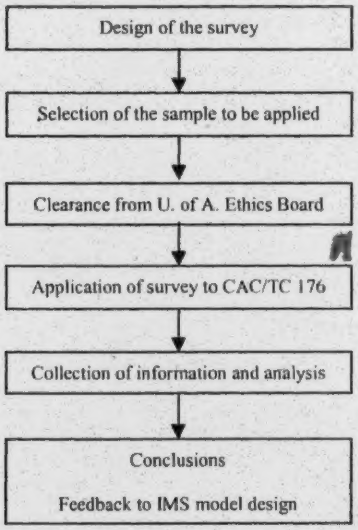
Once an IMS model has been designed, a consultation with quality experts is performed for validation purposes. This validation was done in the middle of this research to assess initial assumptions on the elements necessary to be part of the IMS model, an acceptable graphical representation and how it can be received by researchers and practitioners in the field. The model presented to the experts was based on information collected in each and every one of the management areas selected to be part of the IMS, i.e. quality, environment, occupational health and safety and corporate social responsibility. Also, integrative issues such as IMS current initiatives and auditing are included as part of the initial design for the IMS model. The process of developing an IMS model is an iterative one, which went through several cycles of modifications and updates before deciding that an IMS model was suited for validation.

The instrument selected to do this validation is the survey. Through a survey is possible to target a medium size sample and the answers are written and codified, expect on those open questions that can provide extra information on specific issues that were left out. The objectives of this survey are:

1. Validate whether the elements included in the model are adequate to describe an IMS
2. Validate clarity in the model to present the relationships between management elements
3. Gather input to improve the design for improving perception for potential implementation in real-life situation.

2.0 Methodology

The validation procedure was designed having the previous objectives in mind. In the following diagram is presented the methodology followed.


Design of the survey
Selection of the sample to be applied
Clearance from U. of A. Ethics Board
Application of survey to CAC/TC 176
Collection of information and analysis
Conclusions
Feedback to IMS model design

The questionnaire was divided in three sections:

1. Introductory questions
2. Identifying level of knowledge on IMS issues
3. Validating the proposed IMS model

It was designed to be done in about thirty minutes. Close-ended questions are combined with open-ended questions to gather reliable information plus some extra information when specific explanations are needed.

The first section, which included a total of five questions, is intended to gather information to identify the respondent in terms of expertise in quality or other standardized management systems. The second section, containing eight questions, identifies the level of expertise of the respondent to a number of issues related to integration, describing the MSs utilized in the models known by the respondent and how the model addresses specific management characteristics. Finally, in the last section, the survey, through ten questions, asks specific questions about the proposed IMS model, grading features such as: clarity of the representation, validity of the elements and their relationships, role of stakeholders, possible obstacles for implementation and relevance of management features. The survey also included an attachment, Annex A, where the IMS model was displayed along with a brief explanation.

The targeted population for this validation is the CAC/ISO TC 176, the Quality Committee representing Canada in ISO. This committee presented a convenient forum for the following reasons:

- Members of this committee are quality experts, with a strong knowledge on quality standards: their design, implementation and development trends.
- The composition of the committee is diverse, bringing experience and knowledge from industry, government and academia.
- The opportunity to be consulted at the same time in its annual meeting (October 2003, Quebec City, Qc)

According to schedule, the survey was applied to the members of the CAC/ISO TC 176 in its 2003 annual meeting, celebrated in Quebec City. Given the extremely short duration of the meeting (one day), the members were given the choice to send the answered questionnaire through email. Privacy was ensured by sending the email to a third party who collect the questionnaires, deleting email address or any other identifying label.

From a total of 45 members, 11 of them returned their questionnaires properly answered. Although the return rate is only of 24.4%, the information is sufficient to gather information and validation from quality experts with knowledge on IMS issues. The integration of MSs is still in an embryonic state, which causes that even in national quality representative bodies, only a few people have some understanding on the topic. The results are analyzed in the following paragraphs and conclusions, both general and specific, are drawn to summarize how those Canadian quality experts perceive the proposed IMS model.

3.0 Results

3.1 Background of the respondents

The range of experience of the survey respondents is wide, ranging from 1 year to more than 20 years. The average experience is about 10 years, which is considered a good result since most MSs and standards have been developed in the last twenty years. The surveyed experts have most of their experience on Quality MS (100%) with a small degree of involvement on Environmental MS (36%), both of them mostly on private organizations (72%). Their roles when implementing such MSs have been directly on implementation (90%), auditing the MS (72%), servicing as consultants (45%) and as researchers (10%). Most of them (63%) have experience with two or more MSs implemented in the same organization, an important fact when discussing IMS issues. Their role on these combined MSs have been in implementing (36%), auditing (36%), and consulting (18%) activities.

According to their experience and knowledge, they graded themselves as having medium level (64%) or high level (36%) of understanding of IMS issues. This result confirms the assumption that CAC members would provide a reliable source for validation of an IMS model that uses ISO 9001 QMS as one of the initial MSs.

3.2 General knowledge on IMS models

From those members of CAC who have medium or high level of understanding on IMS current knowledge, more detail information was asked to characterize the IMS models they know of. Eight questions were asked looking to define the type of MSs considered as building blocks, their view on suitability for integration of both the standards and the organization's MSs, the degree of consideration given to topics that being seen as relevant on IMS literature, benefits achieved from the implementation and their opinion on what is needed for helping companies to integrate their MSs.

According to the respondents, the most likely choice to be the basis for the IMS is QMS, following the ISO 9001 guidelines (100% of the respondents). TQM is a second choice (27%) and EMS came in third place (10%). For a second MS to integrate, the most attractive alternatives mentioned were EMS (63%), OHSMS (55%) and CSRMS (18%). Financial and Information Security MS are seen as desirable but no information was provided on how this could be done. These standards, describing QMS, EMS, OHSMS and CSRMS are seen as suitable for integration for 82% of the respondent. Those who disagree with this assertion (18%) mentioned lack of true industry-wide standards and the existence of a heavy 'function-silo' mentality in most of the companies as reasons for standards' unsuitability for integration.

The fifth question was in fact a multiple question containing 19 different statements about the topics that an IMS would involve. The answers were binary in format: "yes" if considered as relevant and "no" in the opposite. These statements or attributes, taken from the current literature on IMS and MSs, are deemed as some aspects that an organization might be interested for when dealing with integration. For instance, being integrated with overall business performance is considered essential for an IMS (100%) whereas the ability of an IMS to achieve registration to a particular standard was declared as less relevant (63%). The results for all statements are displayed in Table I in descending order of agreement.

From their knowledge on IMS, the surveyed members were asked to select, among potential benefits mentioned in IMS literature those that are most likely to be achieved. "Better achievement of organizational objectives" and "use of resources" were unanimously chosen as top benefits, followed by "strengthening of internal processes" (92%) and "potential improvement on financial performance" (82%). Curiously, "avoidance of fines and penalties for lacking of compliance with legal regulations" has the lowest rate with 45% of agreement

Attributes of an IMS	% of agreement
Integration with overall business performance	100%
Use of process approach	100%
Inclusion of continuous improvement	100%
Setting of vision and policies	100%
Build ability to partnerships with suppliers	100%
Attention to stakeholder requirements	91%
Integration of stakeholders in the process	91%
Emphasis on employee training	91%
Open communication with stakeholders	82%
Accountability	82%
Build ability to partnerships with employees	82%
Decision Based Upon Facts	82%
Integrated Performance Measurement	82%
Organizational culture	73%
Leadership	73%
Ability to achieve registration to a particular standard	64%
Applicability to any organization regardless of size or type	64%
Allocation of resources	64%
Flexibility of the starting point (any level of MS maturity allowed)	55%

Table I: Consideration of IMS attributes

When asked what conceptual tools are most needed to enable organizations for integrating their MSs, a "set of guidelines describing the model for integration" was selected as the most important. A "methodology to help organizations with the implementation process" is selected in second place and an international auditable standard describing the elements of the model is trailing in third place. From the current work on ISO in integration issues, they considered a handbook for integrating different standards as the most useful initiative, instead of designing an international auditable standard.

In summary, a QMS is considered the best option to be the initial platform where an IMS can be built. They confirmed what it is mentioned in the literature, although this was expected since the respondents are from such management area. The most value is perhaps the choice of ISO 9001 over others models such as TQM to represent quality. As complementary MSs for integration, both EMS and OHSMS are regarded as good alternatives. The IMS may use standardized versions of MSs as the primary pillars for the model, but it is clear from the answers provided in the survey that such standards are considered solely as initial guidelines for implementation rather than ultimate goals. Some of the traditional benefits for using standards when implementing MSs such as the registration and a strong documentation system are seen less attractive than enabling organization with a system to meet stakeholders' requirements, focusing on continual improvement and building partnership with selected stakeholders. These are some of the benefits mentioned by the respondents an organization may achieve when implementing an IMS with a more optimal use of resources.

3.3 Validating the presented IMS Model

The last section of the survey was designed to obtain the experts opinion on several aspects of a proposed IMS model. Such model is illustrated on a one-page annex, showing a diagram and a brief explanation on its elements. The responses from the survey are presented as follows:

The model was graded in terms of clarity and understandability as well as its completeness. Most of respondents agree that the model possess these features (82%). The remaining 18% (2 members) were unsure but no reasons were provided to explain it. Furthermore, the model was considered to be a promoter of continual improvement (73%), to enable systems thinking around the organization (100%) and to represent stakeholders, their roles and type of involvement properly (91%). Reasons for disagreement were offered:

- The model lacks risk management approach as a key ingredient for an IMS.
- Continual improvement appears to be weakly mentioned one of the respondents who suggested making more visible the cyclical nature of the model.
- Stakeholders are not visibly displayed as the key driver of the entire model because of its small size in the diagram.

When asked about the suitability for integration of the chosen MS standards 63% of the respondents coincide that they are ready, whilst the rest were either unsure (1 member) or completely opposite (2 members). Lack of awareness on environmental or social issues adding to the different structures of the selected standards were mentioned as reasons for unfitting standards.

Attributes to the IMS model	1	2	3	4	5	6	7	8	9	10	11	Avg
Attention to stakeholder requirements	1	1		1	1	2	1	1	1	1	2	1.2
Integration with overall business performance	1	1		1	1	1	1	1	1	3	1	1.2
Integration of stakeholders in the process	2	2	1	2	2	2	2	1	1	1	1	1.5
Ability to achieve registration to a particular standard	2	3		3	2	3	4	3	4	1	2	27
Use of process approach	1	3		2	1	2	2	1	2	3	1	1.8
Inclusion of continuous improvement	2	2		3	1	2	1	1	2	2	1	1.7
Open communication with stakeholders	2	1		2	2	2	1	1	2	1	2	1.6
Accountability	2	1	1	2	1	2	2	1	1	3	1	1.5
Setting of vision and policies	1	1		2	1	2	1	1	1	2	1	1.3
Flexibility of the starting point (any level of MS maturity allowed)	3	2		3	2	3	2	2	3	4	1	25
Applicability to any organization regardless of size or type	3	2		2	3	2	2	1	3	2	3	23
Build ability to partnerships with employees	2	2		2	1	2	1	1	3	3	2	1.9
Build ability to partnerships with suppliers	2	2		2	1	3	1	1	3	3	2	20
Emphasis on employee training	2	1	2	1	1	1	2	1	3	2	1	1.5
Organizational culture	3	1		1	1	1	1	1	2	3	1	1.5
Decision Based Upon Facts	2	1		3	1	1	2	1	1	1	3	1.6
Integrated Performance Measurement	1	1		2	2	2	1	1	1	2	1	1.4
Allocation of resources	1	1		2	1	1	2	1	2	3	2	1.6
Leadership	1	1	1	1	1	1	1	1	1	2	1	1.1

Table II: Evaluation of importance of IMS attributes

The list of attributes used previously in Section I is now used under different approach, looking for rating the degree of importance for the presented IMS model. Attributes like leadership, attention to stakeholder's requirements and setting of policies and vision are considered to have a strong impact on the IMS framework. On the other hand, ability of achieving registration to any of the founding MS standards and flexibility of the starting point for implementation purposes obtained the lower rates. The rating of the entire attribute listing is displayed in Table II, where "1" being as important and so on.

Challenging obstacles for implementing an IMS	1	2	3	4	5	6	7	8	9	10	11	Final Rate
Getting commitment and leadership from top management	1	1	1	1	2	1	1	10	1	1	1	1
Ensuring engagement of stakeholders	2	3	1	3	3	4	2	8		1		2
Breaking up functional barriers	6	5		2	3	2	7	3			2	3
Ensuring support from employees	4	4		4	3	5	6	2				4
Gathering suitable resources for implementing it	3	2		8	3	3	3	9		2		5
Opening communication	7	6		6	3	7	4	1		1	3	6
Changing the performance measurement system	8	8		9	3	10	5	1		1	5	7
Being accountable	5	7		7	3	8	8	6		1		8
Implementing a process approach	9	10		5	3	6	9	5		1	4	9
Focusing on documentation rather than performance	10	9		10	1	9	10	7		3		10
Other, please specify		Balanced scorecard could be adapted as a measurement tool for the performance of the IMS										
					Results considered as feedback loop							

Table III: Evaluation of obstacles for implementing an IMS

The survey also inquired respondent's opinion about strategies and challenging obstacles for implementing such model. The majority of the surveyed committee members (55%) consider building a common core for MSs and later incorporating specific aspects of functional MSs as the most promising strategy for integration. A tie occurred between the remaining two options offered in the questionnaire (27% each one). However, one the respondents clarify that although building an IMS from scratch may be the best way to go, one of the tier alternatives, which may not be possible since many organizations have at least one MSs in place. Implementation can face several obstacles but their impact varies and the survey solicit to the respondents to rate their degree of impact from the most challenging to the least one. By far "getting commitment and leadership from top management" emerged as the most challenging obstacle for implementing the IMS model according to 82% of the answers. "Breaking up functional barriers" is trailing in second place. The resulting list with their corresponding scores is displayed in Table III

4.0 Conclusions

The survey targeted quality experts with medium or high level of knowledge and understanding of IMS issues and even though the return rate was relatively low (11 replies out of 45 questionnaire sent = 24%) the main purpose was reached, i.e. obtaining qualitative validation of the IMS model from the few people with knowledge in the topic. Some bias on the study can be found since the background of the respondents is mostly in quality issues. However, it is in this area where IMS notions emerged and most of the research has been done. Future research would have to aggregate experts from different fields in order to have a more diverse panel for consensus.

The survey shows that QMS is by far considered the anchor for a possible IMS. EMS, OHSMS and possibly CSRMS are the potential players to join the team.

Although different in their underlying structure, MSSs are considered by respondents as suited for integration, requiring the aid from extra tools, both conceptual and methodological. A "set of guidelines describing the model for integration" paired with a "methodology to help organizations with the implementation process" is regarded to be the most helpful tools for integration, thus confirming Jonker and Karapetrovic (2003) statements.

The presented IMS model was assessed in terms of clarity, understandability and completeness. The majority of the members of the CAC who answer this questionnaire agreed that the model has been designed meeting these characteristics. However, some members also mentioned a number of issues they like to see changing in the model. From their own words, the representation of stakeholders in the diagram needs to be of bigger size and the cyclical nature of the model needs to be more visible to show continual improvement as a key issue. A fraction of the questionnaire was directed to evaluate the IMS structure for specific attributes, which later will be taken into account for designing a roadmap for implementation. Some of them, like leadership and teamwork, have also been considered as the most challenging obstacles for a successful implementation. The problems related to the model were considered in the design of a new IMS model (see Figure 1 and 2) with basically the same elements but under different configuration, which is expected to address respondent's concerns. The problems related to the implementation were considered in the design of the IMS roadmap or methodology.

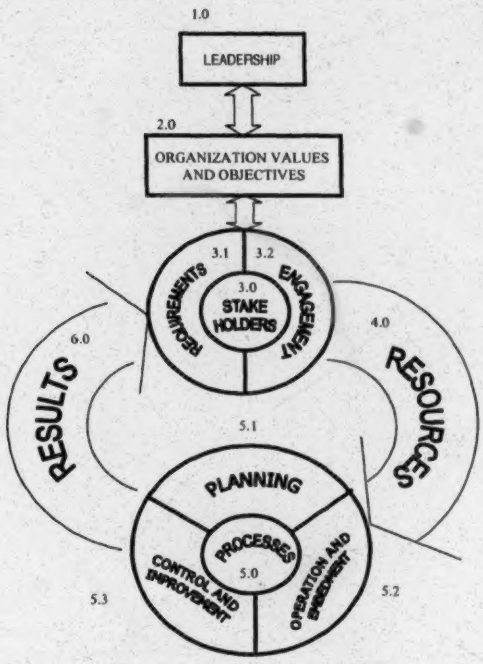

1.0
LEADERSHIP
2.0
ORGANIZATION VALUES AND OBJECTIVES
3.1
3.2
3.0
STAKE HOLDERS
REQUIREMENTS
ENGAGEMENT
4.0
RESOURCES
6.0
RESULTS
5.1
PLANNING
PROCESSES
5.0
CONTROL AND IMPROVEMENT
OPERATION AND EMBEDMENT
5.3
5.2

Figure 1: Surveyed IMS model

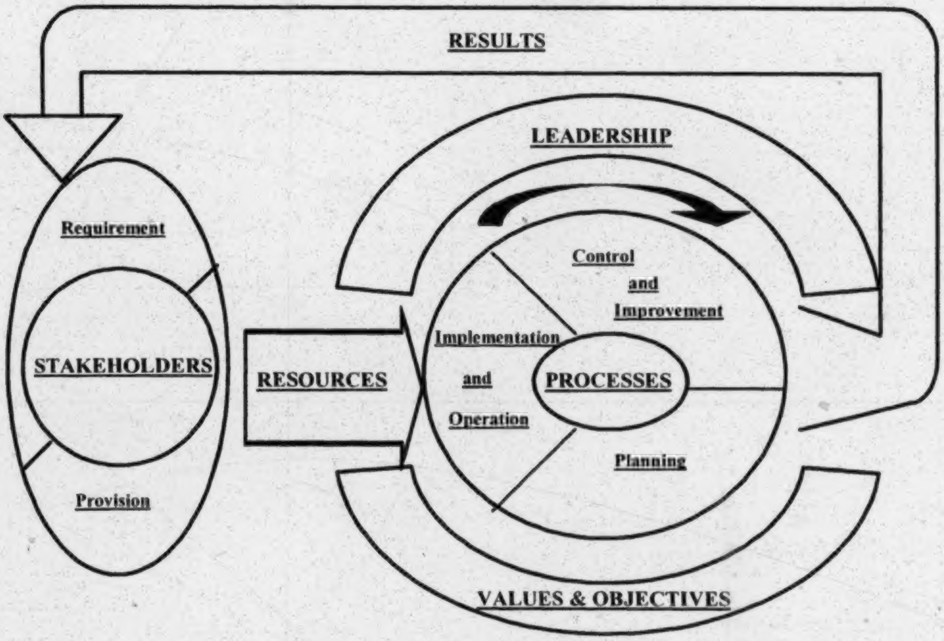

RESULTS
LEADERSHIP
Requirement
STAKEHOLDERS
Provision
RESOURCES
Control
and
Improvement
Implementation
and
Operation
PROCESSES
Planning
VALUES & OBJECTIVES

Figure 2: The IMS "Motor" Mode

Appendix B-2

Request for Ethical Review of Activities Involving Human Subjects

Specify Research Type?:
Ph.D. Research

Project Title:
A Proposal for an Integrated Management System: Model and Methodology

Principal Investigator(s) and Degree(s):
Miguel Rocha (MSc, PhD Candidate)
Dr. Stanislav Karapetrovic (Department of Mechanical Engineering)

Funding Source:
None

Advisor (if applicable):
Dr. Stanislav Karapetrovic P.Eng. (Department of Mechanical Engineering)

Status or Rank:	Office Phone:
Associate professor	**(780) 492-9734**
Department:	Faculty:
Department of Mechanical Engineering	**Engineering**

Building and Room:
5-2 Mech. Bldg

Sponsoring Agency:	Budget:
Not applicable	**None**
Project Period:	Budget Period:
September-December 2004	**Not applicable**

Please provide answers to all of the following questions. **All projects submitted for review must be typed (no handwritten proposals accepted)**. Only one copy is required and will be retained for the Ethics Committee files and eventually reproduced for Committee use.

PURPOSE AND OBJECTIVES

1) **What are you doing?**
I am conducting a study on how to create and implement an Integrated Management System (IMS), which encompasses the conceptual model as well as the roadmap for implementing it

2) **Why? What benefits are there to the participants, to society, or to further research? What are you trying to find out?**
The present study is part of my research towards my PhD degree in the Department of Mechanical Engineering at the University of Alberta. The objective of the study is the creation of an IMS as an alternative to address different stakeholders' requirements paired up with a roadmap in which it is shown how a potential organization could implement it.

3) **Where will the study take place?**
It will be carried out in Quebec City during the meeting of the Canadian Advisory Committee (CAC) for the Technical Committee (TC) 176 of the International Organization for Standardization (ISO).

4) **How are you going to do it (e.g., interviews, physical testing, videotaping, etc.)?**
A questionnaire will be used to gather information from the experts of both committees, i.e. in Quebec City meeting. The questionnaire will be administered using a survey setting.

5) **How long will it take (each part of the study; total time required of participants)?**
The expected number of questionnaires comes around 20. Participants are expected to spend about 60 minutes in answering those questions

DESCRIPTION OF METHODOLOGY AND PROCEDURES

6) **Where will the project be conducted (room number or area; if not U of A location, site authorization allowing this research must be provided)?**
It will be carried out in Quebec City during the meeting of the Canadian Advisory Committee (CAC) for the Technical Committee (TC) 176 of the International Organization for Standardization (ISO). The survey will be scheduled through Dr. Stanislav Karapetrovic as a liaison with both committees.

7) **How will the project be explained to the subjects?**
As a cover letter, an information sheet will be provided with the questionnaire containing a brief description of the research, its benefits, the role of the

participants and the treatment of information gather from them. When required, the participants may contact the researchers through email or telephone.

8) **If the subjects are minors, how will assent be secured:**
Not applicable

9) **How will you make it clear to the subjects that their participation is voluntary and that they may withdraw from the study at any time they wish to discontinue participation?**
On the same information sheet mentioned above, the participant is informed that his or her participation is voluntary, having the alternative to withdraw from the study in any time they want with no repercussions on them or the information they would have provided. The same outline is also mentioned in the consent form, which the participant will sign at the time he/she answers the questionnaire.

10) **Will your project utilize (check):**
    - X **Questionnaires (submit a copy) (See Appendix B-3)**
    - o Interviews (submit sample of questions) –
    - o Observations (submit a brief description, stating your role in the activities observed)
    - o Medical records review -

PERSONNEL

11) **Describe the qualifications of research personnel if special conditions exist within the research that could cause physical or psychological harm, or if participants require special attention because of physical or psychological characteristics, or if made advisable by other exigencies**
Not applicable

DESCRIPTION OF POPULATION

12) **Number of subjects to be involved:**
The expected number of answered questionnaires is around 20.

13) **Description of population to be recruited and rationale for their participation (indicate age range):**
The Canadian Technical Committees, CAC/ISO TC176, has been chosen due to their members' expertise and knowledge on the different aspects of QMS. Age range is not applicable

14) **How are the subjects being recruited?**
For both committees Dr Stanislav Karapetrovic is acting as a liaison for purposes of recruiting and schedule. An agreement will be made with the secretary of the committee to perform these surveys.

15) **What are the criteria for their selection?**
The committee was chosen due to their members' expertise and knowledge on the different aspects of QMS. A national cluster was selected for this survey.

DATA

16) Who will have access to the gathered data?
Only Miguel Rocha as the researcher responsible for this study and Dr. Stanislav Karapetrovic as the supervisor will have access to the collected information

17) How will confidentiality of the data be maintained?
The survey is anonymous and the list of participants will be kept in a locked drawer accessible to Mr. Rocha in his office at the University of Alberta for a period of one year after the last publication regarding this study has been published.

18) How will the data be recorded (instruments, notes, etc.)?
Both the introductory and the final surveys will be recorded in hardcopy. The analysis of the data will be recorded in electronic mean, i.e. an MS excel file

19) What are the plans for retention of data?
The documents with the gathered information will be kept in a locked drawer only accessible to Miguel Rocha for the duration of the study (until December 2004), located in his office at the University of Alberta. The data will be kept for a period of one year after the last publication from this study has been published.

20) What are the plans for future use of data beyond this study?
None.

21) How will the data be destroyed and at what point in time:
The documents containing the data will be destroyed after the one-year period from the last related publication.

22) Where will the signed consent forms be stored (list administrative office and room number)?
They will be stored in Mech. Bldg. Room 4-23 (Auditing and Integration of Management Systems Lab).

BENEFITS, COSTS, RISKS

23) What are the potential benefits to the subjects?
Aiming at building robustness into an Integrated Management System proposal, a set of benefits is expected to come out. Such benefits include an understanding of the challenges for managing several stakeholders and its requirements, an exploration of existing and potential linkages among separate management systems, position among experts towards the initiative, an understanding of the feasibility and the requirements for creating an IMS.

24) What may be revealed that is not currently known?
There is a lack of literature on IMS models and methodologies. Through this study, experience on implementation and evaluation of single management

systems is gathered from the experts on QMS interpolating such knowledge to the integration of initially isolated MSs.

25) Will monetary or other compensation be offered to the subjects?
No

26) What are the costs to the subjects (monetary, time)?
The cost to the subjects in monetary terms is null since they will meet anyway. Members of both committees who agree to answer the survey will be volunteering some time, oscillating around 60 minutes.

27) What specific risks to the subject are most likely to be encountered (physical, psychological, sociological)? If none, state none.
None

28. **What approach will you make to minimize the specific risks?**
Not applicable

Appendix B-3

Sample of Survey applied to ISO/CAC/TC 176

UNIVERSITY OF ALBERTA

Research Investigators

Miguel Rocha	Stanislav (Stan) Karapetrovic
Department of Mechanical Engineering	Department of Mechanical Engineering
University of Alberta	University of Alberta
T6G 2G8 Edmonton, Alberta	T6G 2G8 Edmonton, Alberta
mrocha@ualberta.ca	S.Karapetrovic@ualberta.ca
(780) 492-8684	(780) 492-9734

Research Description:

Hello. My name is Miguel Rocha. I am conducting a study on how to integrate different Management System in a single framework, called Integrated Management System (IMS), which encompasses a conceptual model and a roadmap for implementation. The present study is part of my research towards a PhD degree in the Department of Mechanical Engineering at the University of Alberta. The objective of the study is the creation of an IMS as an alternative to address different stakeholders' requirements including a roadmap in which it is shown how a potential organization can implement it. From the data collected in this survey it is expected to have a better perception of the different issues that have to be considered in designing an IMS as well as the possible benefits that any particular organization would achieve if implemented.

I am asking to all the members of CAC/ISO TC176 to complete a questionnaire exploring their experience and expert's opinion about integration of Management Systems. You are under no obligation to participate in this study. The participation is completely voluntary. You can refuse to participate at any time before or during the completion of the questionnaire. As the questionnaire is anonymous, by filling it out, you are giving your consent to be a part of this study. Your name will not appear in any documents, reports, research papers or the thesis stemming from the survey. No personal information will be kept, as the questionnaires are completely anonymous, thus ensuring confidentiality. If you are returning this questionnaire via email, anonymity is assured by using a third person to collect the response and the collected data will have identifying features removed. In this case, please send the completed questionnaire file to Dr. John Whittaker to john.whittaker@ualberta.ca

Information from the questionnaires will be kept indefinitely in the files of Dr. Stanislav Karapetrovic. If you have any questions regarding this study, please do not hesitate to contact me, or the study coordinator Dr. Stanislav Karapetrovic. If you have concerns about ethical considerations with this study, you may contact Dr. John Whittaker, Chair of the Faculty of Engineering Ethics Committee, at 1-(780)-492-4443. Dr. Whittaker has no direct

An Integrated Management System

INTRODUCTORY QUESTIONS

1. Length of time as a member of CAC/ISO TC176_________________

2. In what sector does your primary organization operate?
☐ Private organization ☐ For profit public organization
☐ Government Organization ☐ Non-Government Organization
☐ Educational organization
☐ Other, please specify:____

3. How have you been involved with Quality, Environmental or other Management Systems (MS)? *(Please check all that apply)*
☐ By direct implementation ☐ As a consultant for organizations
☐ As an auditor ☐ As a researcher
☐ Not at all
☐ Other, please specify: ____

4. Have you implemented or audited two or more different Management Systems in the same organization?
☐ Yes ☐ No
If the answer is yes, which MSs? ____
What was your role?
☐ Implementing ☐ Auditing ☐ Consulting
☐ Other, please specify: ____

5. What is your current knowledge on the Integration of Management Systems?
☐ None. I have not heard about it before
☐ Slight at best. I have heard the concept but I do not know any model.
☐ Medium. I am familiar with the concept of the Integration of Management System.
☐ High. I have been involved in the practice aspects of integrating Management Systems

SECTION I

If your answer to question 5 of the last section was "Medium" or "High", please answer the following questions. Otherwise, please go directly to question 7 of this section.

1. In your experience, what were the MSs that considered for integration? *(Please check all that apply)*
☐ Corporate Social Responsibility MS
☐ Environmental MS.
☐ Occupational Health and Safety MS
☐ Quality MS
☐ Information MS
☐ Financial MS
☐ Other, please specify: ____

2. Which model was used as foundation for the IMS you are most familiar with?
☐ A standardized Quality Management System (ISO 9001, TS 16949 or similar)
☐ A standardized Environmental Management System (ISO 14001, EMAS or similar)
☐ A framework following TQM principles (Canadian Business, MBNQA, EFQM or similar)
☐ A standardized Sector Specific Management System, please specify: ________________
☐ An organization specific Management Model, please specify:_______________________

3. Do you consider that the current standards for those selected MSs are suitable for integration?
☐ Yes, they are. ☐ No, they are not ☐ Unsure
a) If no, why not? ______________________________
b) If unsure, why? ______________________________

4. Do you consider that the current Management Systems in your organization are/were suitable for integration?
☐ Yes, they are. ☐ No, they are not ☐ Unsure
a) If no, why not? ______________________________
b) If unsure, why? ______________________________

5. Please indicate if the following attributes are considered in the model for integration you are familiar with.

ATTRIBUTES	**YES**	**NO**
Attention to stakeholder requirements	( )	( )
Integration with overall business performance	( )	( )
Integration of stakeholders in the process	( )	( )
Ability to achieve registration to a particular standard	( )	( )
Use of process approach	( )	( )
Inclusion of continuous improvement	( )	( )
Open communication with stakeholders	( )	( )
Accountability	( )	( )
Setting of vision and policies	( )	( )
Flexibility of the starting point (any level of MS maturity allowed)	( )	( )
Applicability to any organization regardless of size or type	( )	( )
Build ability to partnerships with employees	( )	( )
Build ability to partnerships with suppliers	( )	( )
Emphasis on employee training	( )	( )
Organizational culture	( )	( )
Decision Based Upon Facts	( )	( )
Integrated Performance Measurement	( )	( )
Allocation of resources	( )	( )
Leadership	( )	( )

6. What are the potential benefits of implementing this model? *(Please check all that apply)*
☐ Better achievement of organizational objectives
☐ Better use of resources
☐ Eventually, an improvement of the financial performance
☐ Major involvement with different stakeholders
☐ Strengthening internal organizational processes
☐ Avoidance of penalties, fines and losses from lack of compliance with regulations
☐ Other, please specify: ______________________________

7. In terms of conceptual tools, what is needed for integrating different MSs? *(Please order the following items in terms of priority, "1" being the most important and so on)*
☐ An international auditable standard describing the elements of the model
☐ A set of guidelines describing the model for integration
☐ A methodology to help organizations with the implementation process
☐ Description of the auditing process, including a recommended profile for auditors
☐ Other, please specify: ______________________________

8. There are different initiatives on how ISO can help in integrating different MSs. Which of the following would you consider to be most helpful for organizations? *(Please order the following items in terms of priority, "1" being the most important and so on)*

☐ An international auditable standard
☐ A handbook for integrating different standardized MSs.
☐ Aligning cycles of writing the standards
☐ Other, please specify: ____

SECTION II

In "Annex A", a general model for an Integrated Management System (IMS) is illustrated, including a brief depiction on how this model is able to integrate different Management Systems. The model is intended to integrate at least four standardized Management Systems, namely, Corporate Social Responsibility (CSRMS), Environmental (EMS), Occupational Health and Safety (OHSMS) and Quality (QMS). Please read the description on "Annex A" and answer the following questions:

1. According to your understanding, is the presented IMS model clear and easy to understand?

☐ Yes, it is. ☐ No, it is not ☐ Unsure

a) If no, why not?____
b) If unsure, why? ____

2. Is the illustrated model considering all the necessary basic elements for an IMS?

☐ Yes, it is. ☐ No, it is not ☐ Unsure

a) If no, why not?____
b) If unsure, why? ____

3. Using a scale of 1 to 4, please indicate how important you consider each attribute is to an organization's performance when integrating its different Management Systems.

Degree of importance	
1. Very Important 3. Slightly Important	2. Important 4. Not at All Important
ATTRIBUTES	***IMPORTANCE***
Attention to stakeholder requirements	
Integration with overall business performance	
Integration of stakeholders in the process	
Ability to achieve registration to a particular standard	
Use of process approach	
Inclusion of continuous improvement	
Open communication with stakeholders	
Accountability	
Setting of vision and policies	
Flexibility of the starting point (any level of MS maturity allowed)	
Applicability to any organization regardless of size or type	
Build ability to partnerships with employees	
Build ability to partnerships with suppliers	
Emphasis on employee training	
Organizational culture	
Decision Based Upon Facts	
Integrated Performance Measurement	
Allocation of resources	
Leadership	

4. In your personal view, are the current standardized versions of the selected MSs suitable to be integrated?

☐ Yes, they are. ☐ No, they are not ☐ Unsure

a) If no, why not? ______

b) If unsure, why? ______

5. What strategy may be used for implementing the IMS displayed in "Annex A"?

☐ Build a common core for MSs and later incorporate specific aspects of functional MSs
☐ Implement an initial MS and incorporate the remaining MSs on top of it
☐ Build the IMS from scratch and implement all functional MSs at the same time
☐ Other, please specify: ______

______

6. Do you think the presented IMS model reflects and encourages a systemic approach?

☐ Yes, it does. ☐ No, it does not ☐ Unsure

a) If no, why not? ______

b) If unsure, why? ______

7. Does the presented IMS model promote continual improvement in organizational culture?

☐ Yes, it does. ☐ No, it does not ☐ Unsure

a) If no, why not? ______

b) If unsure, why? ______

8. To your understanding, are stakeholders well represented in the presented IMS model?

☐ Yes, they are. ☐ No, they are not ☐ Unsure

a) If no, why not? ______

b) If unsure, why? ______

9. Are the roles and involvements of stakeholders well addressed in the presented IMS model?

☐ Yes, they are. ☐ No, they are not ☐ Unsure

a) If no, why not? ______

b) If unsure, why? ______

10. What would be the most challenging obstacles for implementing such an IMS? *(Please order the following items in terms of priority, "1" being the most challenging and so on)*

☐ Ensuring support from employees
☐ Ensuring engagement of stakeholders
☐ Changing the performance measurement system
☐ Focusing on documentation rather than performance
☐ Gathering suitable resources for implementing it
☐ Getting commitment and leadership from top management
☐ Breaking up functional barriers
☐ Opening communication
☐ Being accountable
☐ Implementing a process approach
☐ Other, please specify:

______

ANNEX A

An Integrated Management System Proposal: a Model and a Methodology

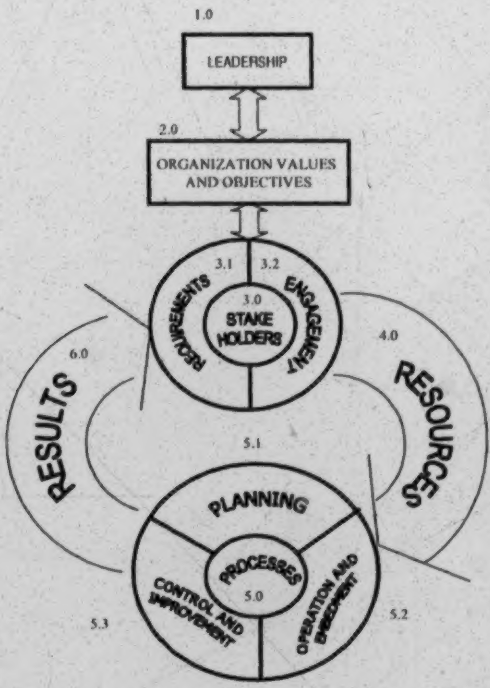


Figure 1. The IMS Model

The model presented in Fig. 1 is focused on organizational stakeholders as the foundation over which the entire model structure is built. For further detail, table I shows the breakdown of IMS elements into sub-elements and its correspondence with different MS standards.

An organization is steered by its top management through leadership (1.0). Strong leadership is required to get the consensus and participation from the stakeholders. Through the setting of organizational values and objectives (2.0), an organization's leaders map the path the entire organization will follow in its tactical and strategic activities, including treatment of specific stakeholders. Identifying the interested parties or stakeholders (3.0) is a critical element, since the model relies on the involvement of relevant stakeholders.

Stakeholders play an important role in an organization's performance and the results will depend on how well the organization can recognize them. Broadening a quality concept related to the customers' nature, the model appreciates the nature of any stakeholder as the duality formed by the stakeholders' requirements (3.1) and the stakeholders' engagement (3.2).

The model includes a process cycle to achieve the objectives set by elements 2.0 and 3.1. Process approach is strongly incorporated into the model in element 5.0. Once the stakeholder requirements have been defined, processes are then designed to meet them. Planning (5.1) is the first stage in creating such processes. Different stakeholders will provide an assortment of Resources (4.0). Operative and supportive processes (5.2) are later implemented and embedded as part of the organization's activities. And finally the processes are controlled and improved (5.3), in order to get the specified results of products and processes (6.0) to satisfy the stakeholders.

Appendix C

IMS Implementation Methodology procedure

Appendix C-1

Obtaining Top Management Commitment

Purpose	Resources	Procedures	Outcome
Consideration of integration, from top management, as a main business strategy bringing strong support and commitment, leading to a vision and strategic objectives developed for integration	• Internal knowledgeable personnel, top and middle management, to champion the idea. • Receptive top management members with experience on MS issues • External entities that can provide assistance (consultants, partners, registrars) • Description of the requirements the company is engaged to • IMS guidelines • Updated information on IMS from specialized journals, books, magazines, and publications	• Consolidation of relevant information supporting the notion of integration • Presentation(s) to top management team • Release of commitment statement from top management, both as a team and individually • Designation of management representative • Definition of integration vision within the overall business plan • Communication to the entire company of the undertaking project of system integration	• A visible, strong commitment from top management, formulated as a team and personally, towards the integration of the organization's systems. • A representative of top management as director of the project, with responsibility and authority to take decisions

Appendix C-2

Perform Initial Review

Identify, through an extensive review, to what extent the IMS requirements are: • Inexistent or opposite in direction • Incomplete • Ready to be plugged in	• Auditors, external and internal, with experience on selected MSs • Expertise, internal and external, on particular MSs such as quality, environmental, etc • Information system technologies • Software for assessment or audit management • Audit results, both internal and externals, from related systems • IMS guidelines and related information on the original MSs such as scholar and practical literature, guidelines, handbooks, etc	• Definition of audit plan describing scope of the assessment, team members and methods to use • Gathering necessary resources for a full assessment • Provision of training to internal parties participating on the assessment activities • Realization of assessment activities • Preparation of audit report describing all relevant findings (gap analysis) • Release of report and gathering of feedback	• An extensive audit report, describing the existing gaps between the organization's management systems and the IMS guidelines

Appendix C-3

Outline IMS Implementation

Purpose	Resources	Procedures	Outcome
Define the implementation plan by setting: • The IMS scope • The organizational units to be considered (pilot project) • Stakeholders and their requirements to be incorporated in the system • Resources to be used in each iterative loop	• Champion of the project (management representative) • Top management members as representatives of the organization's functions • Representatives of partners (suppliers, customers, community, etc) • Trends of market and societal requirements • Stakeholders' requirements, gathered from panel of experts, interviews, questionnaires, related statistics and studies • Organization's performance in potential areas for integration • Status of currently implemented systems • Records from previous MS implementation	• Collection of information of stakeholders' requirements • Forecast on future needs (requirements and resources) • Drafting the general outline for implementing an IMS • Definition of timeframe for the IMS initial review (next step)	• A proposal for IMS implementation, specifying the scope (which Management System), the sequence of integration (In what order) and the estimated timeframe for the initial review • An outline of the general process for implementation, fulfilled with data regarding to resources and time frames when available. This outline can be set using the steps mentioned in this methodology as a blueprint

Appendix C-4

Enhance Top Management Leadership Skills

Provide top management with awareness, skills and competencies necessary for leading, maintaining motivated and controlled the organization in its pursuit of an IMS	• Internal expertise on leadership and change management issues • Personnel considered as "role models" already working in the organization • Consultants and outside personnel for training and example providers • Information, currently available, about employee satisfaction • Training and workshops on leadership and managerial issues, leadership styles, models for performance measurement • Literature available on particular leadership and managerial skills	• Identification of needs for training and awareness directed to enhance overall leadership • Provision of workshops, seminars and other methods for enhancing the leadership of top management • Verification of progress of the leadership training programme • Definition of indicators for measuring employee perception of top management performance • Measurement of employee perception in leadership issues	• A management body trained and committed in leadership and managerial skills to lead and promote the necessary changes for the IMS as well as involvement of stakeholders

Appendix C-5

Identify Stakeholders and Initiate Communication

Purpose	Resources	Procedures	Outcome
For each MS to be integrated • Identify stakeholders and communication channels for reaching them • Get those channels ready and • Define, with stakeholders' direct participation, their requirements and roles as inputs for the IMS	• Marketing, PR, Sales, Legal, Human resources and departments with close working relationship with related stakeholders • Personal connections from top/middle level management as well as members of the Board • Industry and trade associations that the organization is part of • Databases with information of organization's contacts	• Identification of stakeholders involved in the IMS • Identification of areas and personnel of the organization involved in the communication process with stakeholders • Definition of communication channels • Opening of communication channels • Probe quality of communication channels • Definition of stakeholders, in terms of resources and requirements, using corresponding channels	• Definition of stakeholders targeted by the corresponding MSs in turn for integration. Such definition should include requirements to be satisfied by the organization and provision of resources to engage into the organization • Communication channels with stakeholders, ready to be used for IMS purposes and informed to the entire organization

Appendix C-6

Define Values and Objectives

For every MS to be integrated • Organizational values should be defined and communicated to employees and involved stakeholders • Organizational objectives should be deployed from the values to the entire organization (horizontal and vertically)	• Top management leaders • Consultants on managerial and strategic topics • Literature on MS and strategic planning • Current principles, policies, mission statements and objectives working in the organization • Analysis of the current performance, if available, measured against current objectives	• Collection of stakeholder requirements • Definition of social and ethical values • Release of mission statement, policies, codes of practices and other • Definition and deployment of objectives for IMS • Communication of values and objectives to organization and related stakeholders	• A complete plan for implementing the necessary process, operative and supportive, to create the MS in turn and integrate it in the IMS framework. Based on this methodology, this plan should outline the procedure, resources to be used, the roles, responsibilities and authorities of employees' involved and tentative timeframes

Appendix C-7

Identify and Plan Set of Processes

Purpose	Resources	Procedures	Outcome
For each MS to be integrated • Envisage the elements or particular processes, operative and supportive, missing and • Create a plan describing implementation objectives, resources and timeframe	• Top management members • Management body of related divisions and departments • Consultants and external expertise if required • Initial IMS initial review report • Information about current MS already in place and working. These MSs may or may not be within the IMS scope	• Verification of no change status of selected processes as described in the IMS initial review • Planning the implementation process of the IMS • Identification of required resources • Identification of roles, responsibilities and authorities of employees • Approval of the implementation plan by top management	• A set of written and extensively communicated values and objectives • Values may be in the form of mission statement, policies, company's principles, codes of practices, etc • Objectives deployed long the organization, horizontal and vertical, from policies and values

Appendix C-8

Provide Training and Awareness to Employees

For the first MS to be integrated • The necessary knowledge of the IMS model and elements • The reasons behind the awareness of stakeholders requirement • Competence on general concepts For each consecutive system • Knowledge and competence on system-specific concepts, regulations, techniques, and methodologies	• Internal and external knowledgeable personnel with experience or formal education • Employees with previous experience and understanding on MS concepts including those used to implement other MSs • Consultants and external experts on specific competencies mentioned before • Classrooms, meeting rooms and infrastructure suitable for management and technical training • Previous training programmes, including workshops, offered by the company or outside to implement MS, even those out of the IMS scope • Literature on several topics of education and learning organization • Learning organization and general training kits	• Identification of needs for building new or reinforce existing competencies in the employees • Identification of employees to be trained or inform about IMS elements and basic concepts • Establishment of training plans • Assessment of employees' perception of single training sessions • Follow-up of the assimilation of the new competencies	• A well-trained group of employees in the basic considerations of MS and the IMS elements. • A group of employees fully aware of the reasons for integration and their role in the satisfaction of targeted stakeholders

Appendix C-9

Gathering Resources for Implementation

Purpose	Resources	Procedures	Outcome
For each MS to be integrated, engage stakeholders into the process to get • the financial, • infrastructure, • information, • and human resources required for implementing the system deployed as required by the IMS	• Experienced people, internal and external, on implementation of MS within the industry sector • Information technology systems • Records of previous MS implemented (including those outside of IMS scope) as reference • IMS guidelines • Information available on implementing MS considered within the scope • Procurement techniques and methodologies • Information on infrastructure, information technology, environmental control equipment, H & S equipment	• Identification of specifications of resources (human resources, infrastructure, technology systems, techniques and procedures) • Assessment of stakeholders for capability in providing resources • Initiate contact with stakeholders for resource provision • Collection of resources • Verification of resources	• Assurance of resources deployed according to necessities of the company and specifications written in IMS

Appendix C-10

Implement New or Modify Existing Processes

For each MS to be integrated • Define objectives • Deploy resources • Communicate to stakeholders involved in the process • Deploy the resources acquired with the proper people in place to run the process according to the IMS requirement	• Owners of processes and systems from top and middle management • Consultants or technical experts • Resources achieved in Step 9 • Software to manage processes such as Stella, Visio, etc • Methodologies and techniques for processes management • IMS guidelines	• Definition of roles, responsibilities, authorities and accountabilities for processes • Deployment of resources • Verification of process and deployment of resources	• A set of processes in place in the organization wrapped around the operative process to meet the requirements of specific stakeholders. • When possible the processes are built over existing organizational activities

Appendix C-11

Operate Existing System

Purpose	Resources	Procedures	Outcome
For each MS to be integrated • the processes should be run for a given period of time • at least until the first whole set of outcomes is generated and stakeholders may provide a complete feedback	• Employees trained (from Step 8) and ready to work following processes already in place • Top management involved, committed and personally active in the operation of the IMS • IMS guidelines • Information system technology for specific processes (databases, statistics, quality control, emissions, labelling and tracking) • Formats, report and document templates to plan and control specific procedures (IMS Clause 1.4)	• Definition of cycle objectives • Realization of product according to new processes • Monitoring and measurement of product • Monitoring and measurement of process	• Products and by-products delivered to stakeholders according to planned objectives • Records and measures of organization performance (internal indicators for efficiency, effectiveness and quality of processes)

Appendix C-12

Implement New or Modify Existing Processes

For each MS to be integrated • assessment must be performed to verify all elements are in place and • the risk to deviate from initial objectives in the future	• Auditors, internal and externals, capable to assess, integrally, conformance to an IMS • Technical expertise, internal and external, for assessing specific issues related to Q/E/CSR/OHS • Software for audit management and storage, analysis and presentation of audit evidence • Equipment for measuring and keeping audit evidence • AMS guidelines • Best practices in auditing available literature • Format, records and work documentation templates	• Definition of audit scope (IMS partial or totally installed) • Planning of audit activities • Designation of audit team • Development of audit • Writing of audit report • Release of audit report and reception of feedback and follow up	• An audit report focused on verification of the IMS, partially or totally installed, against corresponding IMS requirements • This report would mention non-conformances and areas of risk in the already implemented IMS as well as suggestions for correction and improvement • Training for internal and external personnel on auditing and IMS elements

Appendix C-13

Measure Stakeholder Satisfaction

Purpose	Resources	Procedures	Outcome
For each MS to be integrated • the involved stakeholders are consulted to see their perception • on organization's performance on issues within the IMS scope	• Employees' trained and skilled in measuring and 'feeling' the level of stakeholder satisfaction • Advocates and stakeholders themselves to provide feedback and information • Information technology system • Techniques and methodology for measuring stakeholder satisfaction • Surveys, panels of control, marketing analysis	• Collection of information from stakeholders • Analysis of information • Release of conclusions on stakeholder satisfaction • Determination of action plan according to level acquired	• Knowledge and understanding of levels of stakeholders' satisfaction achieved from the IMS, partially or totally • The achieved levels are compared against the planned levels set at the beginning of each IMS cycle to conclude if the system is meeting objectives in terms of stakeholders' satisfaction

Appendix C-14

Identify Causes for Underachievement

If required Analyse the levels of stakeholder satisfaction and determine the reasons for underachievement: • Design of the processes • Execution of the processes	• Employees trained in solving problems and root analysis • Consultants familiar and with thorough understanding on MS issues • Information systems (simple or sophisticated) • Root analysis and problem solving techniques and methodologies • Statistical techniques • Design of Experiments • Quality engineering and assurance techniques	• Collect information from internal processes and stakeholder perceptions • Develop root analysis of processes lower than expected • Determination of action plan according to the reasons for underachievement (from design or from execution)	• An action plan derived from an analysis of the main reasons behind the lower than expected performance of the organization in internal indicators • And levels of stakeholders' satisfaction. This action plan is directed to correct potential causes in the design of processes or implementation and operation of them

Appendix C-15

Integrate Remaining MSs into the IMS

Purpose	Resources	Procedures	Outcome
After each MS is integrated • Go to Step 5 to integrate the following MS • Until the IMS scope is completed After the IMS is complete: • Analyze alternative to integrate more MS or • Enhance current IMS	• Top management and entire organizational unit • Information systems (simple or sophisticated) • Information on market and societal trends	• Recognition of progress in IMS • Motivation of employees and stakeholders to continue until IMS is complete	• Recognition to the entire organization and stakeholders involved in the process of implementation • Motivation for employees and partners in the integration of consecutives MS into the system

Appendix C-16

Implement an Integrated Performance Measurement System

Define and build a framework for measuring the performance of the organization in at least three areas of objectives: economical, environmental and societal, which is linked to the business plan	• Employees with knowledge and competence on performance measurement • Consultants, academics and developers of integral measurement frameworks • Up-to-date models for integral performance measurement such as • Balanced Scorecard, Business excellence models scoring, Triple bottomline, Performance Prism	• Identification of key indicators for integral performance • Identification of methodology tool to use for measuring performance • Design of a tailored performance measurement subsystem focused in integration • Communication to employees and link objectives to the framework • Monitoring and measurement of performance for processes and products	• A subsystem for measuring performance in an integral manner that allows the organization to grade its performance in at least three areas: economical, environmental and societal. • Information suitable to be used for decision making process and setting of strategic plans

Appendix C-17

Perform Self-Assessment Cycles

Purpose	Resources	Procedures	Outcome
Enhance the IMS by implementing self-assessment cycles for assessing weaknesses, strengths and opportunities for improvements within the system	• Internal assessors with experience and knowledge in self-assessment • External advisors with experience and knowledge on self-assessment to guide employees • Information systems (simple or sophisticated) • Methodological tools for self-assessment such as • EFQM approaches • MBNQA approach • Internal audit tools for measuring audit quality and risk	• Identification of opportunity for improvement • Collection of resources necessary for self-assessment • Training and evaluation of internal assessors • Development of self-assessment activities • Development of action plans for improvement	An upgraded subsystem for assessment, driven by internal personnel and focused on opportunities for improvement, higher maturity on system management and sharing of organization best practices.

Appendix C-18

Benchmarking for Improvement

Compare specific products and processes with best-in-class either from other organizational units or companies to bring best practices	• Personnel, internal and external, trained on benchmarking procedures • Partners from competitors, customers and suppliers • Information systems (simple or sophisticated) • Methodological tools for collecting information from other organizations • Techniques for comparison • Information on internal performance • Information from trade and commercial associations	• Identification of products and processes to be improved • Identification of best-in-class range of organizations • Development of benchmarking activities • Development of action plans for implementing best practices • Follow up to best practices and deployment throughout the entire organization	An upgrade in the assessment system to bring best practices into the organization applied to specific products and processes to make them of similar performance levels to that of the best-in-class companies

Appendix D-1

Analysis of AA 1000 Section 10 (Auditing)

Clause	ISO 19011 match	Action
P 10	Corresponds to 5.1 (General – Managing an audit programme). AA 1000 only considers isolated audits and not audit programme. Also, the nature of audits considered in AA1000 is of external conduction.	None
P 10.1	Corresponds to 6.5.4 (Collecting and verifying information) and 5.3.3 (Procedures)	None
P 10.2	Corresponds to 3 (Terms and definitions)	None
P 10.3	Is consistent to 6.2.1 (Appointing the audit team leader). However, AA1000 only considers external auditors, selected according to audit scope and legitimacy.	Include criteria for selection of audit team leader based on audit scope and legitimacy (6.2.1)
P 10.4	Not addressed in ISO 19011.	Include the requirement to appoint auditor from the outset of the scoping process (6.2.1)
P 10.5	Consistent to 6.6.1 (Preparing the audit report). Audit opinion (AA1000) is similar in concept to audit conclusion (ISO 19011). AA1000 also mentions explicitly that the governing body (board/top management) remains responsible for the overall audit process	Include in 5.3.1 explicit mention of responsibility of top management for the overall auditing process.
P 10.6	Corresponds to 6.6.1 (Preparing the audit report). However, this requirement goes beyond in AA1000 by mentioning that auditor (team leader) is responsible of the audit conclusions when advice was taken from third parties (stakeholder panel, technical experts)	Include in the report when technical experts and other parties were consulted for auditing purposes (6.6.1)
P 10.7	Relates to 6.6.1 (Preparing the audit report), AA1000 adds the degree of confidence in the audit report	Include degree of confidence of auditor in audit report (6.6.1).
P 10.8	Corresponds to 6.6.1 (Preparing the audit report). The audit report, as described in AA1000, should also contain opinion of quality for both the process and the social and ethical report.	Include in 6.2.2 (Defining audit objectives, scope and criteria) that audit is done to the process and to the social and ethical report
P 10.9	Consistent to 6.5.5 (Generating audit findings) and 6.5.6 (Preparing audit conclusions) for both absolute and graded conclusions. For areas for improvement 6.6.1 (Preparing audit report) although ISO 19011 considers it as non-mandatory: "if specified in audit objectives"	None
P 10.10	See P 10.9	None

Clause	ISO 19011 match	Action
P 10.11	Corresponds to 6.6.2 (Approving and distributing the audit report). AA1000 requires also the signature from auditors in the audit report	Add to 6.6.2 the requirement of having auditor's signature in the audit report
P 10.12	Not found in ISO 19011. AA1000 emphasises the weighing of sufficiency and appropriateness when looking for audit evidence	Include sufficiency and appropriateness as audit principles (4.0 in ISO 19011)
P 10.13	See P 10.12	See P 10.12
P 10.14	See P 10.12	See P 10.12
P 10.15	Corresponds to 6.5.4 (Collecting and verifying information). Some differences in terminology: subject matter (AA1000) and information (ISO 19011) are synonyms. More detail is provided in ISO 19011 but in the box of practical help. Scope is set based on AA1000 principles as set in 6.2.2 (Defining audit objectives, scope and criteria)	None
P 10.16	Unclear on its meaning. AA1000 mentions "audit methods used to address…". The use of "address" may refer to "incorporate", "gather", "choose" or "analyse". If it is incorporate or gather ISO includes it in 6.5.4 (Collecting and verifying information). If it is analyse ISO does in 6.5.5 (Generating audit findings)	None
P 10.17	Not addressed by ISO 19011. AA 1000 requires that external audits shall include support from internal and other MS audits in their execution.	Add in 6.5.4 (collecting and verifying information) that support can be obtained from internal audits and other audit processes (MSs outside of the audit system scope)
P 10.18	Auditors' level of confidence relates slightly to 6.2.3 (Determining feasibility of auditing) and to 6.5.6 (Preparing audit conclusions). However, AA1000 is more explicit to include factors that influence over the level of confidence of the audit.	Include in 6.2.3 (Determining the feasibility of the audit) the issue of level of confidence and possible factors influencing it.
P 10.19	Relates to 6.2.2 (Defining audit objectives, scope and criteria). However, AA1000 considers the size of the scope as directly impacting upon the quality assurance of the audit	Add scope of audit as component of level of assurance of the audit in 6.2.2 (Defining audit objectives, scope and criteria)
P 10.20	Corresponds to 7.0 (Competence of auditors). ISO 19011 is undoubtedly more thorough and clear in defining requirements for auditors	None
P 10.21	Corresponds to 6.2.4 (Establishing the audit team). AA1000 is more demanding as it requires that the "role of each auditor is clearly documented and identified to each audit"	Add in the audit report (6.6.1) the roles of each auditor

Appendix D-2

Consolidation of the Auditing Proto-System

General Format

Clause	Title of the Clause
	Description of original requirements as found in ISO 19011
Source: BP or CSR	**Brief description of the action to take** Reasons supporting the inclusion or change of this particular requirement Draft of the proposed clause (including changes or additions)

Content

1	**Scope**
	None
2	**Normative reference**
	None
3	**Terms and definitions**
	None
4	**Principles of auditing**
	The basis for the impartiality of the audit and objectivity of the audit conclusions Auditors are independent of the activity being audited and are free from bias and conflict of interest. Auditors maintain an objective state of mind throughout the audit process to ensure that the audit findings and conclusions will be based only on the audit evidence
BP	**The basis for the impartiality of the audit and objectivity of the audit conclusions**
	Auditors maintain an objective state of mind throughout the audit process to ensure that the audit findings and conclusions will be based only on the evidence. Independence of auditors is balanced with the principle of due professional care. The value of an audit comes from both the expertise and care of its development and the objectivity and impartiality
CSR	Include "Sufficiency" as an audit principle
	The measure of the quantity of the audit evidence and refers to the extent to the audit procedures performed.
CSR	Include "Appropriateness" as an audit principle
	The measure of quality or reliability of audit evidence and refers to the nature and timing of the audit procedures performed and the accounting, auditing and reporting process.
5	**Managing an audit programme**
5.1	**General**
	An organization having a need to conduct audits should implement and manage an efficient and effective audit programme. The purpose of an audit programme is to plan the type and number of audits and to identify and provide resources necessary to conduct t The audit programme can include audits with a variety of objectives. Depending upon the size, nature and complexity of the organization to be audited, the audit programme can include one, a few, or many audits, and joint and combined audits An organization can establish more than one audit programme The organization's top management should grant the authority for managing the audit programme. Those responsible for managing the audit programme should: a) establish the objectives and extent of the audit programme b) establish the responsibilities, resources and procedures; c) ensure the implementation of the audit programme; d) monitor, review and improve the audit programme e) ensure that appropriate audit programme records are maintained
BP	Top management should demonstrate active commitment for the conduction of the audit and the implementation of corrective, preventive and related actions that derive as a result of the audit a) establish the objectives and extent of the audit programme, including the appropriate mix of internal and external audits of the audit programme

5.2	**Audit programme objectives and extent**
5.2.1	**Objectives of an audit programme**

	Objectives should be established for an audit programme, to direct the planning and conduct of audits. These objectives can be based on consideration of: a) management priorities b) commercial intentions c) management system requirements d) regulatory and contractual requirements e) need for supplier evaluation f) customer requirements g) needs of other interested parties h) potential risks to the organization
BP	**Objectives should be established for an audit programme, to direct the planning and conduct of audits. These objectives are based on consideration of:** c) management system requirements, especially those for internal audits. e) need for supplier evaluation for building and maintaining a supply chain i) Continual improvement of the system's capability to satisfy specific stakeholders. This should be a priority for internal audits j) needs for identification of strengths and weaknesses for decision-making processes

5.2.2	**Extent of an audit programme**

	The extent of an audit programme can very and will be influenced by the size, nature and complexity of the organization to be audited, as well as by the following: a) scope, objective and duration of each audit to be conducted; b) frequency of audits to be conducted; c) size, nature and complexity of the organization audited d) the number, importance, complexity, similarity and locations of the activities to be audited; e) standards, regulatory and contractual requirements and other audit criteria f) need for accreditation or registration/certification g) the results of previous audits or a previous audit programme review h) language, cultural and social issues i) concerns of interested parties j) significant changes to an organization or its operations
BP	**The extent of an audit programme can vary and will be influenced by:** a1) business strategies and specific programmes within the IMS scope g1) the findings and results of previous audits, follow-ups or a previous audit programme review

5.3	**Audit programme responsibilities, resources and procedures**
5.3.1	**Responsibilities**

	Responsibility for managing an audit programme should be assigned to one or more individuals with a great understanding of audit principles, auditor competence and the application of audit techniques.
CSR	In all cases, top management is still responsible for the overall auditing processes

5.3.2	**Audit programme resources**

	When identifying resources for the audit programme, consideration should be given to a) financial resources necessary to develop, implement, manage and improve audit activities d) the availability of auditors and technical experts having competence appropriate to the particular audit programme objectives
BP	g) the availability of auditing firms for external audits with knowledge in the sector and the market and with the capability according to the size and complexity of the auditee's operations. The selected firm should be engaged only as for auditing purposes. The organization should require a frequent rotation on the members of the auditing team to assure independence and due professional care

5.3.3	**Procedures**
	None
5.4	**Audit programme implementation**
	None
5.5	**Audit programme records**
	None
5.6	**Audit programme monitoring and reviewing**
	The implementation of the audit programme should be monitored and at appropriate intervals reviewed to assess whether its objectives have been met and to identify opportunities for improvement. Monitoring should be carried out by using performance indicators that measure, for example: - the ability of the audit teams to implement the audit plan - conformity with audit programmes and schedules - feedback from audit clients, auditees and auditors This audit programme review should consider, for example: a) results and trends from monitoring; b) conformity with procedures; c) evolving needs and expectations of interested parties; d) audit records; e) alternative or new auditing procedures f) consistency between audit teams Results of audit programme reviews can lead to corrective and preventive actions and the improvement of the audit programme
BP	**The implementation of the audit programme should be monitored and at appropriate intervals reviewed to assess whether its objectives have been met and to identify opportunities for improvement.** - the quality assurance level of the audit programme g) results of assessment of the auditing programme. This assessment may be done through a systematic peer-review process for both h) audits follow ups and closure i) audit finding dealings
6	**Audit activities**
6.1	**General**
	None
6.2	**Initiating the audit**
6.2.1	**Appointing the audit team leader**
	Those responsible for managing the audit programme should appoint the audit team leader for the specific audit
CSR	Among the criteria for appointing the audit team leader, the audit scope and level of legitimacy should be included the audit team leader should be appointed from the outset of the scooping, or at least, an in depth knowledge of the area and processes should be assured at the time of the audit
6.2.2	**Defining audit objectives, scope and criteria**
	The audit scope describes the extent and boundaries of the audit such as physical locations, organizational units, activities and processes to be audited and the time period covered by the audit
BP	In the case of an SME, physical locations are the same, usually only one and the same goes for the number of organizational units.
CSR	The audit scope influences the level of quality assurance of the audit Activities and processes to be audited are usually similar. This and the shortage of resources of an SME requires that the time period must be short for both the audit and the consequent actions from the audit findings
	The audit criteria can include applicable policies, procedures, standards, laws and regulations, management system requirements, contractual requirements or industry/business sector codes of conduct
CSR	For social and ethical issues, the audit criteria should include the audit report, which is similar in function to the quality manual
6.2.3	**Determining the feasibility of the audit**
CSR	Include the audit level of confidence and the assessment of possible factors influencing in determining the feasibility of the audit
6.2.4	**Selecting the audit team**
	None

6.2.5	**Establishing initial contact with the auditee**
	None
6.3	**Conducting document review**
	None
6.4	**Preparing for the on-site audit activities**
	None
6.4.1	**Preparing the audit plan**
	The audit plan should include or describe: a) the audit objectives b) the audit criteria and any reference documents c) the scope, including the identification of the organizational and functional units and processes to be audited d) the dates and places where the on-site audit activities are to be conducted e) the expected time and duration for the on-site audit activities, including meetings with the auditee's management and audit team meetings f) the roles and responsibilities of the audit team members and the accompanying persons g) the allocation of appropriate resources to critical areas of the audit
BP	h) the methods for collecting information in both the document stage and the on-site stage (Product tracking, trail of information, interviewing) i) the techniques used to verify quality of information collected (sampling and statistical techniques or similar when required)
	The amount of detail provided in the audit plan should reflect the scope and complexity of the audit
BP	For internal audits, since the scope is usually narrower than external audits (which are usually set to audit the entire MS) the amount of detail can lessened in the descriptions of audit criteria, roles and responsibilities and the level of communication
6.4.2	**Assigning work to the audit team**
	None
6.4.3	**Preparing work documents**
	None
6.5	**Conducting on-site audit activities**
	None
6.5.1	**Conducting the opening meeting**
	None
6.5.2	**Communication during the audit**
	None
6.5.3	**Roles and responsibilities of guides and observers**
	None
6.5.4	**Collecting and verifying information**
	Information relevant to the audit objectives, scope, and criteria, including information relating to the interfaces between functions, activities, and processes should be collected by appropriate sampling during the audit and verified Only information that is verifiable can be audit evidence. Audit evidence should be recorded as such NOTE. The audit evidence is based on samples of the information available. Therefore there is an elements of uncertainty in auditing, and those acting upon the audit conclusions should be aware of this uncertainty
BP	The information available should be sampled using statistical or similar reliable techniques to obtain the audit evidence. The use of those techniques will depend on the complexity of the system and the scope of the audit
CSR	Information available for external audits can be obtained from results of internal audits and other audit processes

Appendix D-3

Auditing Management System (AMS) Requirements

Auditing Management System		Source	
Clause	Description	IMS	APS
AUDITING MANAGEMENT SYSTEM			
1.1	General requirements		5.1
1.2	Terms, Definitions and References for auditing		2.0 & 3.0
1.3	Applicability of processes		1
1.4	Control of audit work documents	1.4 & 1.6	6.4.3
	Superseded by IMS 1.4 and 1.6 in terms of control of documents and records Incorporate the entire 6.4.3 as indicated in APS		
1.5	IMS manual	1.5	
	b) the documented procedures established for the IMS (including auditing if required), or reference to them,		
1.6	Auditing system records		5.5
LEADERSHIP			
2.1	Leadership system	2.1	
2.2	Stakeholder focus	2.2	
2.3	Management commitment and responsibility for auditing		5.3.1
2.4	Auditing system monitoring and reviewing		5.6
VALUES AND OBJECTIVES			
3.1	Principles of auditing		4
3.2	IMS Policies definition and deployment	3.2	
3.3	Organizational Culture - Communication and Accountability	3.3	
3.4	Definition of auditng system objectives		
3.4.1	Objectives of an audit programme		5.2.1
3.4.2	Extent of an audit programme		5.2.2
3.5	Identification and deployment of strategies	3.5	
STAKEHOLDER IDENTIFICATION		4	
4.0.1	Stakeholder identification	4.0.1	
4.0.2	Stakeholder integration	4.0.2	
4.1	**Stakeholder requirements (Title only)**	4.1	
4.1.1	Objectives of an audit programme		5.2.1
4.1.2	Accountability of the auditing process	4.1.2	
4.1.3	Identification of requirements related to the auditing report		6.6.1
4.1.4	Identification of requirements related to the auditing process		5.2.1 & 5.2.2
4.2	**Stakeholder Provision (Title only)**		
4.2.1	General	4.2.1	
4.2.2	Partnership	4.2.2	
	The organization should require the participation of external auditors or experts in the different MSs when auditing newly integrated MSs or when performing audits covering two or more MSs. A partnership should be built wih them to bring their expertise without compromising the principle of independence (See section 2)		
4.2.3	Communication in the audit process		
	Establish initial contact with the auditee		6.2.5
	Communication during the audit		6.5.7
	Conducting the closing meeting		6.5.2
4.2.4	Planning involvement	4.2.4	
4.2.5	Auditing resources		5.3.2

Auditing Management System		Source	
Clause	Description	IMS	APS
RESOURCES			
5.1	Provision of resources	5.1	
5.2	Competence and evaluation of auditors	7.1	
5.2.1	General	7.1	
5.2.2	Personal attributes	7.2	
5.2.3	Knowledge and skills (Title only)	7.3	
5.2.3.1	Generic knowledge and skills of quality management system and environmental man	7.3.1	
5.2.3.2	Generic knowledge and skills of audit team leaders	7.3.2	
5.2.3.3	Specific knowledge and skills of quality management system auditors	7.3.3	
5.2.3.4	Specific knowledge and skills of environmental management system auditors	7.3.4	
5.2.4	Education, work experience, auditor training and audit experience (Title only)	7.4	
5.2.4.1	Auditors	7.4.1	
5.2.4.2	Audit team leader	7.4.2	
5.2.4.3	Auditors who audit entire IMS	7.4.3	
5.2.4.4	Levels of education, work experience, auditor training and audit experience	7.4.4	
5.2.5	Maintenance and improvement of competence (Title only)	7.5	
5.2.5.1	Continual professional development	7.5.1	
5.2.5.2	Maintenance of auditing ability	7.5.2	
5.2.6	Auditor evaluation (Title only)	7.6	
5.2.6.1	General	7.6.1	
5.2.6.2	Evaluation process	7.6.2	
5.3	Involvement of personnel	5.2.3	
	a) defining procedures to make the panel of experts and technicians working on its behalf during the development of an audit aware of the importance of conformity with the IMS or functional policies, requirements and procedures		
5.4	Maintenance of human resources (OHS/E/CSR)	5.2.4	
5.5	Infrastructure	5.3	
5.6	Information	5.4	6.3 & 6.5.4
AUDITING PROCESSES			
6.0.1	Extent of the audit programme	6.0.1	5.2.2
6.0.2	Determining audit feasibility		6.1 & 6.2.3
6.0.3	Exclusion of stakeholders in processes	6.0.2	
6.1	**Initiating the audit**		6.2
6.1.1	Defining audit objectives, scope and criteria		6.2.2
6.1.1	Preparing the audit plan		6.4.1
6.1.2	Preparing work documents		6.4.3
6.1.3	Planning the audit report		6.6.1
6.1.4	Conducting document review		6.3
6.1.5	Audit programme responsibilities		5.3.1
6.1.6	Appointing the audit team leader		6.2.1
6.1.7	Selecting the audit team		6.2.4
6.1.8	Assigning work to the audit team		6.4.2
6.1.9	Roles and responsibilities of guides and observers		6.5.3

Auditing Management System		**Source**	
Clause	**Description**	**IMS**	**APS**
6.2	**Implementing and Operating**	6.2	
6.2.1	Audit programme implementation		5.4
6.2.2	Audit programme procedures		5.3.3
6.2.3	Purchasing	6.2.2	
6.2.2.1	Supplier's involvement	6.2.2.1	
6.2.2.2	Purchasing Information	6.2.2.2	
6.2.2.3	Control of purchased product	6.2.2.3	
6.2.4	Collecting and verifying information		6.5.4
6.2.5	Generating audit findings		6.5.5
6.2.6	Preparing audit conclusions		6.5.6
6.2.7	Conducting the closing meeting		6.5.7
6.2.8	Preparing, approving and distributing the audit report		6.6
6.2.9	Preparing the audit report		6.6.1
6.2.10	Completing the audit		6.7
6.2.11	Identification and traceability *The organization should identify the origin, author and other information that serves to maintain identification and traceability of the auditing work documents for future review*	6.2.3.4	
6.2.12	Control of monitoring and measuring devices	6.2.3.7	
6.3	**Controlling and Improving**		
6.3.1	Measuring, analysis and improvement of auditing processes	6.3.1	5.6
6.3.2	Monitoring and measurement of the audit report *The organization should monitor and measure the characteristics of the auditi report to verify that its requirements are fulfilled. This should be carried out at appropriate stages of the writing and releasing in accordance with the planned arrangements (See 6.1)* *Evidence of conformity with the acceptance criteria should be maintained. Records should indicate the team leader who authorizes the release and distribution of the audit report (See 1.7)* *Release and distribution of the audit report should not proceed until all the planned arrangements have been satisfactorily completed, unless otherwise approved by a relevant authority.*		
6.3.3	Conducting audit follow-up		6.8
6.3.4	Analysis of Data		6.3.6
6.3.5	Assessment Processes		6.3.7
6.3.6	Control and improvement		6.3.8
6.3.6.1	Continual improvement		6.3.8.1
6.3.6.2	Corrective action		6.3.8.2
6.3.6.3	Preventive action		6.3.8.3
RESULTS			
7.1	Operational indicators and results	7.1	5.6
7.1.1	Quality Results	7.1.1	

Appendix E-1

CCA IMS – Identification of Stakeholders

Second Implementation Cycle – Including Environmental Requirements

Stakeholder	Requirement	Area	Communication	Observations
Customers	Manufacturers of electronic products may require to their suppliers to have an EMS in place. Usually an ISO 14001 registered system	- Engineering - Product Management - Sales & Marketing	Direct exchange of information about environmental aspects. Indirect communication through surveys, reports and publications of new regulations affecting key customers (partners)	Environmental regulations for disposal and life-cycle assessment are becoming mandatory and an environmental. Design and Development is the production' stage to foresee these regulations
Suppliers	CCA requires an EMS in place for manufacturers of the outsourced product	- Engineering - Product Management	Direct communication and exchange of information of their impact on environment including: water consumption, lead inclusion, energy consumption, air emissions and final disposal of circuits	The major impact of the company into the environment comes from the outsourced process.
Employees	See first cycle	See first cycle	See first cycle	Direct communication is required
Government	Environmental agencies in communities where CCA main office and manufacturing factories (Seoul, South Korea and Beijing, China)	- Engineering - Product Management		
Community	Community is broadened to include the community of manufacturing partners where the semiconductors are actually manufactured	- Strategy & Business Development - Human Resources	Direct communication with community leaders committees for environmental issues. Indirect communication from reports and surveys about community's environmental perspective	Communication with community regarding environmental responsibility is important for a publicly held company like CCA
Environment	Natural resources employed or impacted by the CCA's operations and products	- Engineering - Product Management	Indirect communication through governmental agencies and NGO's for semiconductor manufacturing regulations, e.g. water consumption, lead inclusion	Most impact comes from outsourced operations. However, office operations can also contribute to diminishing environmental impacts, e.g. recycling, air emissions from company's vehicles
Advocacy groups	Non-governmental groups dedicated to protect the environment, e.g. Greenpeace. They can exert pressure and point flaws to governmental agencies	- Human Resources	Direct communication, through exchange of information, with Canada's stakeholders. Indirect communication, through manufacturer partner, with international stakeholders	Although not official, environmental pressure usually comes from advocacy groups. This pressure may provoke new regulations or pinpoint additional pressure from government

Appendix E-2

CCA IMS – Resources

FIRST CYCLE – ENHANCING QUALITY

RESOURCE	DESCRIPTION	SOURCE
HUMAN RESOURCE		
Employees in all current divisions: Operations, Engineering, Product Management, and Other areas	• There is no need for additional employees. • Training and awareness of employees is suggested to reinforce existing QMS, but mostly directed to lay the foundation for the IMS as described in the antecedent step	• Employees (Main provider) • Top management (Coordination and leadership)
INFORMATION		
Requirements of Stakeholders and organization	• Customer Satisfaction levels • Profitability, ROI and finance rates • Productivity, reliability and other internal quality objectives • Compatibility with current systems • **Response to emergency situations of customer and suppliers, e.g. facility shot downs, special contracts with key customers**	• Customers (Main provider) • Trade associations • Suppliers
Silicon Technology	Available processes for producing wafers. Up-to-date information about • process capability, • levels of performance expected (yield) • levels of defectivity and reliability of resulting wafers • Expected costs (fixed and variables) • Limitations of the processes • **Potential technology advancements**	• Suppliers (Main provider) • Employees • Customers
Packaging Technology	Available processes to produce package for the Integrated circuit. Information about them regarding: • process capability, • levels of performance expected (yield) • Expected costs (fixed and variables) • Limitations of the processes • Potential technology innovations	• Suppliers (Main provider) • Employees (Provider) • Customers (Provider)
INFORMATION TECHNOLOGY		
D&D information systems Manufacturing information systems Sales and service Information systems	• Information systems designed to storage, handle, share, analyze and manage records on NPI, Manufacturing, Sales and Marketing, and Quality related. • Although CCA does have several information systems in place such as Proquis and CDC, for integration purposes is suggested to integrate them or upgrade them to an all-encompassing system, e.g. SAP.	• Employees (Main Provider) • Suppliers • Customers
EQUIPMENT		
Testing equipment	• Electronic equipment for testing samples from D&D phases and from manufacturing batches. These samples are tested for ESD, latch up, defectivity, and reliability.	• Suppliers (Main provider) • Employees
IT Equipment for • designing wafers, package and assembly	• Computing equipment, including both hardware and software, for designing and testing the new products for system connectivity and their components	• Suppliers (Main provider) • Employees
• sales and marketing	• Computing equipment for managing information of customer, purchase orders, work in progress, delivery and post service aspects.	

FIRST CYCLE – ENHANCING QUALITY

RESOURCE	DESCRIPTION	SOURCE
INFRASTRUCTURE		
a) buildings, workspace and associated utilities b) process equipment, both hardware and software	• CCA already possesses building and workspace for the productive and supportive processes. They have all associated utilities, i.e. power, heating, internet connection, telephone, etc.	• Shareholders (financial providers)
c) supporting services such as transport or communication	• Mentioned in previous aspect • Transportation and communication are also available	
ENVIRONMENTAL HEALTH		
• Environmental conditions in the workplace and surroundings	• Headquarters (Canada), D&D (USA), and Sales (UK, Asia) are mainly office buildings with few environmental aspects to take care of to provide a well suited working environment. A smoke free environment may be enforced in all buildings to comply with this requirement	• Employees
• Environmental conditions in manufacturing suppliers facilities	• Since manufacturing is outsourced, environmental conditions are controlled through periodic reports from suppliers as well as possible audits to ensure this requirement, especially regarding cleaning rooms.	• Suppliers
OCCUPATIONAL SAFETY		
• Conditions in the workplace	• Workplaces designed to minimize possibility of accidents and incidents that can put in jeopardy employees and their activities. • Plans for emergency and response need to be implemented for potential fire hazard or release of Nitrogen (used for testing and storage purposes) in Headquarters	• Employees
• Conditions in manufacturing processes	• Information from suppliers is necessary in a periodic basis regarding occupational safety of employees. Issues to include are: exposure to chemicals, possibility of accidents and incidents	• Suppliers

SECOND CYCLE – INCLUDING ENVIRONMENT

RESOURCE	DESCRIPTION	SOURCE
HUMAN RESOURCE Employees in all current divisions: • Sales & Marketing • Strategy and Business Development • Operations • Engineering • Product Management	• There is no need for additional employees. However, specific personnel in the quality and supply chain departments may be assigned to follow environmental performance of suppliers. • Training and awareness of employees in environmental issues an reinforcement of the foundation for the IMS, is taken care of in the previous step here	• Employees • Consultants • Government • Advocacy groups
INFORMATION Requirements of Stakeholders and organization Silicon Technology Packaging Technology	• Regulation on environmental impacts of the IC, including life-cycle analysis. The regulations included are those applicable to headquarter communities, manufacturing facilities, and international markets • Alternatives for reduction on energy consumption in office regular operations • Available manufacturing process for wafer production and their specific environmental aspects, i.e. water consumption, energy consumption, air emissions, waste management • Available manufacturing process for packaging and assembling final product and their specific environmental aspects, i.e. water consumption, energy consumption, air emissions, waste management • Latest developments on technology, materials and processes in IC manufacturing, e.g. reduction of water consumption, Pb and Pbc's free products	• Government • Advocacy groups • Community in general • Employees • Suppliers • Costumers
INFORMATION TECHNOLOGY Supply chain information system	Include compatible databases, expand existing ones and, if possible, consider interchange information directly from supplier to CCA, to include information of: • on environmental regulation, contractual and voluntary agreements • levels of performance of CCA and manufacturing processes	• Government, provincial and federal • Employees • Suppliers • Customers
EQUIPMENT Testing equipment Hardware and Software for designing wafers, package and assembly	Not directly Applicable. Manufacturing of wafer, package and final assemblies are outsourced.	
INFRASTRUCTURE a) buildings, workspace and associated utilities	Make sure that heating, power and illumination installation uses energy efficient devices and networks.	• Employees
b) process equipment, both hardware and software c) supporting services such as transport or communication	Not directly Applicable. Manufacturing of wafer, package and final assemblies are outsourced	• Supplier
HEALTH AND SAFETY At the workplace and surroundings	• See Information on stakeholder requirements	• Employees
- At the manufacturing suppliers facilities	• See Information on stakeholder requirements	• Supplier

Appendix E-3

CCA IMS – Modification of Processes

PROCESS
NEW INTRODUCTION PRODUCT

FIRST CYCLE
ENHANCING QUALITY

Processes	Modification/Inclusion	IMS Requirement	
Idea Generation Concept Definition Planning	**No modification or inclusion is required.** CCA does have a thorough analysis of customer requirements, especially from those pertaining to Tier I. The Concept for a New Circuit for system connectivity undergoes for a set of verification, validation and changes when passing each gate.	6.2.1.1	Functional aspects
		6.2.1.2	D & D inputs
		6.2.1.3	D & D outputs
		6.2.1.4	D & D reviews
		6.2.1.5	D & D verification
		6.2.1.6	D & D validation
		6.2.1.7	D & D changes
Development	**Minor modification.** CCA involves key suppliers, IP providers and IC manufacturers and assemblers, from the beginning and along the whole NPI and manufacturing processes. However, it is necessary to broad such inclusion to consider capability of suppliers to respond to emergencies from CCA and their own (include health & safety and environmental circumstances)	6.2.2.1	Supplier involvement
	None	6.2.2.2	Purchasing information
	None	6.2.2.3	Control of purchased product
	None	6.2.3.1	Control of product and service provision
	Major Modification. Emergency preparedness and response is not considered by CCA. Capability to respond to Tier I Customers requirements even in the face of incidents or accidents during the NPI process. For instance, in Development Phase, CCA would identify potential emergency situations and plan specific activities to respond and diminish the risk to customers. For instance Lost of data, IP or D&D related – Have backup data from frequent saving in alternative databases Fire hazards – Fire hazard programme implemented and emergency plan on alternative location	6.2.3.2	Emergency preparedness and response
	None	6.2.3.3	Validation of processes for production and services provision
	None	6.2.3.7	Identification and traceability

PROCESS
NEW INTRODUCTION PRODUCT

FIRST CYCLE
ENHANCING QUALITY

Processes	Modification/Inclusion	IMS Requirement	
Development	**Major inclusion** Due to the special nature of this process, CCA would require to have specific activities for safekeeping suppliers and customers property both physical (boards, testing devices, testing equipment, IC, IT devices) and IP (silicon, programming, packaging technology)	6.2.3.4	Stakeholders property
	Minor modification. The designs, specifications, diagrams, samples and other elements than conform the New Product shall be identified, handled, packaging, storage and protected. New IP generated in the product should be protected through licenses and patents.	6.2.3.5	Preservation of product
	None	6.2.3.6	Control of manufacturing and measuring devices
	None	6.3.1	Measuring, analysis and improvement processes
	None	6.3.2	Monitoring and measurement of processes
	None	6.3.3	Monitoring and measurement of product
	None	6.3.4	Control of non conforming product
	Applicable only if CCA considers integrate social and ethical issues into the IMS	6.3.5	Report for social and ethical issues
Qualification	**Major inclusion** Measure levels of customer satisfaction for those in Tier I (Design and Manufacturing) and Tier II (mostly relying in Manufacturing and Service) Measure levels of employee satisfaction and analyze the data to identify gaps in performance, opportunities for improvement and their impact on employee satisfaction and on the overall IMS performance	6.3.6	Analysis of Data
	Not Applicable	6.3.7	Assessment Processes
	None	6.3.8	Management Review
	None	6.3.9	Control and improvement
	None	6.3.9.1	Continual improvement
	Minor modification – (Qualification Phase) The documented procedure established to define requirements for reviewing nonconformities shall include employees' and suppliers' feedback in the process for NPI	6.3.9.2	Corrective action
	None	6.3.9.3	Preventive action

Appendix E-3

CCA IMS – Modification of Processes

PROCESS NEW INTRODUCTION PRODUCT		SECOND CYCLE INCLUDING ENVIRONMENT	
Processes	**Modification/Inclusion**	**IMS Requirement**	
Qualification	**Inclusion – (Qualification process)** CCA will ask from manufacturing suppliers involved in the fabrication of alpha and beta samples to perform such control over devices measuring levels of air emissions, water consumption and chemicals utilized	7.5.6.1	Control of manufacturing and measuring devices
	Inclusion – (Development and Qualification Phases) Activities for measuring, analyzing and improving the environmental performance of the IC designed in these phases is conducted and included as part of the deliveries. Levels of Pb, PFCs and other contaminants are some of the environmental aspects to take care of.	6.3.1	Measuring, analysis and improvement processes
	Major inclusion – (Development and Qualification Phases) All CCA's offices (Headquarters and remaining buildings) are monitored in the energy and fuel consumption as well as levels of recycling of paper and computing supplies	6.3.2	Monitoring and measurement of processes
	Major inclusion – (Development and Qualification Phases) CCA should monitor and measure the components of the new product to verify levels of toxicity and approved materials. Samples alpha and beta are used for this purpose	6.3.3	Monitoring and measurement of product
	Inclusion – (Qualification Phase) When a specific design does not conform to the environmental regulation for intended market, CCA identifies and modifies, if possible, the design to comply with planned objectives.	6.3.4	Control of non conforming product
	Applicable only if CCA considers integrate social and ethical issues into the IMS	6.3.5	Report for social and ethical issues
	Major inclusion – (Qualification Phase) Measure levels of performance regarding to objectives for environmental impacts in the designed product and the operations in CCA's offices.	6.3.6	Analysis of Data
	Performed in step 12 (Auditing)	6.3.7	Assessment Processes
	Inclusion – (Development and Qualification Phase) During the analysis performed in each gate of the NPI process, management reviews the environmental performance as part of the analysis to consider whether or not to enter the next level.	7.5.6.2	Management Review

PROCESS
NEW INTRODUCTION PRODUCT

SECOND CYCLE
INCLUDING ENVIRONMENT

Processes	Modification/Inclusion	IMS Requirement	
Idea Generation Concept Definition Planning	**Major inclusion – (Definition and Planning)** Environmental aspects in the design of the IC for system connectivity should be included. These aspects are related to the IC itself and the manufacturing processes Environmental aspects should be reviewed, verified and validated against regulations, contractual and voluntary agreements. For example, aspects to consider as input for D&D are chemical elements used in the product (lead, PFCs, and others) When necessary changes should be done	6.2.1.1 6.2.1.2 6.2.1.3 6.2.1.4 6.2.1.5 6.2.1.6 6.2.1.7	D & D planning D & D inputs D & D outputs D & D reviews D & D verification D & D validation D & D changes
Development	**Minor modification – (Development Phase)** CCA involves key suppliers, IP providers and IC manufacturers and assemblers, from the beginning and along the whole NPI and manufacturing processes. During development and qualification phases suppliers should provide information on their capability of their current environmental systems	6.2.2.1	Supplier involvement
	Minor Inclusion – (Development and Qualification Phase) When considering purchasing IP, silicon and packaging technology to use in an NPI process, CCA will require they are within environmental regulations, national and international.	6.2.2.2 6.2.2.3	Purchasing information Control of purchased product
	Modification – (Development and Qualification Phase) When developing and qualifying a new product, environmental issues already identified should be included in the process. For example, existence of harmful materials into the chip or use of potentially pernicious processes in its manufacturing and assembling	6.2.3.1	Control of product and service provision
	Not Applicable to this process	7.5.6.3	Emergency preparedness and response
	Inclusion – (Qualification Phase) Environmental impact of IC and corresponding manufacturing process are reviewed during the Qualification Phase and included in the set of deliveries.	7.5.6.4	Validation of processes for production and services provision
	Minor Inclusion – (Development and Qualification Phase) Traceability of the alpha and beta samples (Tier I and Tier II Customers respectively) is used for purposes of environmental concerns when an IC is deemed to contain undesired elements.	7.5.6.5	Identification and traceability
	Not applicable to this process	7.5.6.6	Stakeholders property
	Not applicable to this process	6.2.2.4	Preservation of product

PROCESS | **SECOND CYCLE**
NEW INTRODUCTION PRODUCT | **INCLUDING ENVIRONMENT**

Processes	Modification/Inclusion	IMS Requirement	
Qualification	**Inclusion – (Qualification Phase)** CCA's policies and objectives consider minimum levels of environmental performance in • The IC components and its corresponding fabrication processes • The normal operations of CCA's offices. Control and improvement activities are implemented to reach such objectives.	6.3.7.1	Continual improvement
	Inclusion – (Development and Qualification Phase) When levels of minimum environmental performance in the IC product and foreseen manufacturing processes are below objectives, CCA implements actions to correct such gap. For example, changes in design, use of substitute materials and processes for wafer and package fabrication.	6.3.7.2	Corrective action
	Inclusion – (Development and Qualification Phases) Environmental aspects are included in preventive activities, based on stakeholders' requirements and development of regulations. For example, CCA will update, in a regular basis, the database of environmental regulations based on Tier I customer needs as well as those of key manufacturing suppliers. Technology development and innovations are also included in such database	6.3.7.3	Preventive action

PROCESS
MANUFACTURING

FIRST CYCLE
ENHANCING QUALITY

Supplier's Processes	Modification/Inclusion	IMS Requirement	
Wafer fabrication Test Assembly Packaging	Provide to manufacturer supplier requirements in terms of quality for this process. These requirements are the input in supplier's process and have been considered from the NPI process • Yield levels • Delivery time • Cycle time • Flexibility manufacturing (Sudden customer demand) • Reliability index • Response to CCA's complaints and non-conformance reports	6.2.1.7 6.2.1.8 6.2.1.9 6.2.1.10 6.2.1.11 6.2.1.12 6.2.1.7	Functional aspects D & D inputs D & D outputs D & D reviews D & D verification D & D validation D & D changes
Wafer fabrication Test Assembly Packaging	**Major modification.** Suppliers are highly involved, requiring from them a close follow-up of their performance in the manufacturing of CCA's products	6.2.2.4	Supplier involvement
	Major modification Information from the supplier ranges from the NPI, production and delivery of product to the customer. Quality records are required as part of such information covering indicators for yield levels, delivery time, cycle time, reliability and forecasted levels of flexibility.	6.2.2.5	Purchasing information
	Major modification CCA requires controlling the product before sent to the customer. For newly released products, such control should be exercised through the testing of samples either in its testing labs or by another subcontractor before released to customers. For line products, such control should be exercised with random sampling but keeping the flow continuous to the customer CCA will maintain records of such testing and the consequential actions.	6.2.2.6	Control of purchased product
	None CCA is already working with ISO 9001 registered companies. When this is not the case, they performed audits, desk and on-site, to their QMS.	6.2.2.7	Control of product and service Provision
	Major Inclusion CCA requires from its manufacturer supplier to have procedures in place to respond for emergency situations such as • Sudden customer demand • Shutdown of factory for fire, government penalty or similar situations • Strike of workforce	6.2.3.1	Emergency preparedness and response

PROCESS MANUFACTURING		FIRST CYCLE ENHANCING QUALITY	
Supplier's Processes	**Modification/Inclusion**	**IMS Requirement**	
Wafer fabrication	None	6.2.3.2	Validation of processes for production and services provision
Test	None	6.2.3.3	Identification and traceability
Assembly Packaging	**Major inclusion** CCA should require having specific and documented procedures for how the suppliers take care of CCA's property. This property can be in the form of IP, testing boards, samples of IC and lists of customers.	6.2.3.4	Stakeholders property
	None	6.2.3.5	Preservation of product
	None	6.2.3.6	Control of manufacturing and measuring devices
	None	6.3.1	Measuring, analysis and improvement processes
	None	6.3.2	Monitoring and measurement of processes
	None	6.3.3	Monitoring and measurement of product
	None	6.3.4	Control of non conforming product
	Not Applicable within the scope of this IMS	6.3.5	Report for social and ethical issues
	None	6.3.6	Analysis of Data
	None	6.3.7	Assessment Processes
	None	6.3.8	Management Review
	None	6.3.9	Control and improvement
	None	6.3.9.1	Continual improvement
	None	6.3.9.2	Corrective action
	None	6.3.9.3	Preventive action

Note:
CCA requires from its key suppliers, especially those in charge of producing the IC according to CCA's designs, to have a registered QMS following ISO 9001:2000 or to pass CCA's audit. Therefore, it is assumed that manufacturer partners already have the elements marked as "none", which means that no specific modification is necessary.

Appendix E-4

CCA IMS – Auditing Requirements

AUDITING CCA IMS

ELEMENTS	FIRST CYCLE	SECOND CYCLE
GENERAL REQUIREMENTS		
	• CCA already has an audit procedure implemented (Procedure Number 9000000_QA002) • Minor modifications in this procedure are necessary according to the requirements set in the auditing system (Chapter 5) and described in this section • Audit work documents would be controlled as records following the IMS clause 1.4 and 1.6	
LEADERSHIP		
	• CCA Management Representative for the IMS (President or Quality Director) would provide resources, direction and means of control necessary to perform auditing activities • CCA Executive Team should involve key suppliers, i.e. IP developers and IC Manufacturers, to audit NPI and Manufacturing processes • The Executive Team would be responsible for performing and carrying out those actions derived from audit findings (Corrective, preventive and improvement actions) • Auditing report is included into the decision making process of CCA company's strategies	
STAKEHOLDERS		
	Customers, Suppliers (IP developers, IC manufacturers, others), Employees	Customers (Quality and environmental requirements), Suppliers (Quality and environmental issues), Government (Environmental protection departments, either provincial, federal and international) and Advocacy groups (e.g. Greenpeace)
VALUES AND OBJECTIVES		
VALUES	Includes the principles of auditing as part of the auditor training and IMS basic education	Awareness of environmental responsibility in included in employees and auditors training
OBJECTIVES	• Verification of compliance of the CCA's system to the Quality driven IMS • Assurance that stakeholders quality driven requirements are met, i.e. Tier I customers and key suppliers	• Verification of compliance of the CCA system to an IMS driven to a balanced mix of quality and environmental issues • Assurance that stakeholders quality and environmental driven requirements are met, i.e. Those of tier I customers and key suppliers • Verification of balanced approach in setting objectives, assigning resources and measuring performance for quality and environmental aspects • Obtaining ISO 14001 registration if required
EXTENT	• The audit covers the entire IMS bond to quality issues • Given the CCA size (Approx. 200 persons), the whole audit would be performed in two days	• The audit covers the entire IMS bond to quality and environmental issues • Given the CCA size (Approx. 200 persons) and previous audit experience, this system wide audit would be performed in two days
RESOURCES		
Internal auditors – Availability	• CCA has already trained a team of QMS auditors following ISO 9001 and ISO 19011 requirements. Its members comes from Quality, Sales and Engineering.	• Include environmental requirements in auditor training. Given the extent of the environmental aspects under CCA's direct control, i.e. recycling materials, conservation and reduction of energy, the weight of training is not considered burdensome. • NPI and manufacturing processes are also audited for environmental purposes. Auditors with technical background from engineering, supply chain management and design are required to audit these processes.

AUDITING CCA IMS

ELEMENTS	FIRST CYCLE	SECOND CYCLE
Audit Implementation and Operation	• Resources for infrastructure and IT systems are provided by CCA Executive Team. These resources should be taken from the IMS resources pool • Supplier's own auditing team are contacted to produce the necessary information to verify their QMS is aligned to the CCA IMS • Audits would be performed according to the auditing plan, collecting and verifying information about IMS. Particular emphasis is put in auditing:	• Resources in terms of infrastructure and IT systems are provided by the executive team. These resources should be taken from the IMS resources pool • Suppliers own auditing team is contacted to produce the necessary information to verify their EMS is aligned to the CCA IMS. CCA's personnel can be included in such audits as observers • The audit is performed according to the plan, collecting and verifying information on the system. Special issues to examine at are:
IMS Leadership element	Active commitment and devotion of personal time in specific IMS activities from CCA Executive Team. Monitor and measure employees' perception of CCA overall leadership	The setting of environmentally oriented objectives for CCA and particular environmental objectives for members of the Executive Team
IMS Stakeholders	Existence of processes to identify, update and, if possible, anticipate their requirements. Also existence and proper operation to involve Tier I customers and key suppliers	Involvement of suppliers and customers in setting and operating environmentally conscious processes to minimize environmental negative impacts from IC designing and manufacturing
IMS Values and Objectives	Employees' knowledge on CCA's values, describing examples in their daily operations; setting of complementary quality objectives to satisfy both stakeholders and CCA sustainability; evidence of assessment of objectives trade-offs and compromises achieved. Finally, proper deployment of objectives to related processes and areas	Similar to first cycle but including environmental dimension into IMS scope.
IMS Resources	Human resources properly trained, examined and rewarded for implementing, maintaining and improving IMS during both cycles and beyond.	
IMS Processes	Addition of new requirements to CCA ISO 9001-based QMS (Supplier involvement, emergency preparedness and response)	Addition of new requirements to minimize negative environmental impact from operations (manufacture and disposal of IC, recycling and use of electricity and fuel for the CCA normal operations).
IMS Results	Monitoring and measurement of IMS results and their inclusion as input to the CCA quarterly reviews, i.e. NPI and manufacturing processes	
	• Audit work documents should be identified and codified to maintain traceability • A report is prepared, approved and distributed as described in IMS auditing guidelines	• A report is prepared, approved and distributed as described in auditing guidelines.
Controlling and Improving	The audit team leader (Director of Quality Systems) monitors and measures performance of the auditing system and the auditing team Audit quality is also monitored and measured. If gaps or lower than expected levels of performance are identified, corrective actions should be performed, i.e. re-evaluation of evidence, training of auditors	
RESULTS		
	It would establish the following indicators to control the quality of its audits: • Reliability of audit findings: judgment of consistency of work documents • Level of materiality on findings: Judgment of issues audited and the importance to the CCA performance • Percentage of Non-conformance actions completed within time	
		Completeness. Verify both quality and environmental aspects of the system

Appendix F-1

CCB IMS – Identification of Stakeholders

First Implementation Cycle – Enhancing Environmental Requirements

Stakeholder	Requirement	Area	Communication	Observations
Customers	Customers are the province population itself, preserving the environment is part of the requirements that the corporation must comply with.	• Customer Service and Marketing • All five BUs	Direct exchange of information about environmental aspects in a massive bases through surveys and reports and publications of new regulations	For environmental purposes customers are considered as members of the local community
Suppliers	CCB may require for key suppliers related to vegetation management and facilities construction to have an EMS in place aligned to CCB environmental objectives.	• Procurement (Corporate Relations) • Power Supply • Transmission & Distribution	Communication with key suppliers should include information regarding status of its EMS is required	Suppliers for construction of new infrastructure, vegetation management, and maintenance activities should have EMS and objectives aligned to CCB's
Employees	As part of the community, employees require a healthy and well preserved environment both in their workplace and in the general community	• Human Resources (Corporate Relations)	Direct communication (Within areas and BUs) Indirect communication (Employee's surveys)	Direct communication is required
Government	The Canadian Electric Association (CEA) establishes the compliance and registration against ISO 14001 for all its members	• Legal department • Corporate Relations BU • All remaining BUs	Information of the EMS status and compliance with ISO 14001	Legal department keeps track of environmental regulations applicable to the corporation's operations.
Community	The community here is defined as the population of the province who are also owners and customers. They emphasize the preservation of the environment as part of the goals of the corporation	• Corporate Relations BU • Customer Service • All remaining BUs	Direct communication with community leaders committees for environmental issues. Indirect communication from reports and surveys about community's environmental perspective	Communication with community regarding environmental responsibility is important for a public utility like this company
Environment	All natural resources used by the corporation to produce electricity and those impacted for those activities: Hydro system of the province, land, vegetation, air, wildlife, etc. Those resources need to be preserved and the negative impact ameliorated as possible	• Power Supply • Transmission & Distribution • Customer Service & Marketing	Indirect communication through governmental agencies and NGO's for applicable regulations and official perception of company's environmental performance	Environment should be increased in the CSP goals and disseminated all around the five BUs. Engineering design plays a critical role given the scale of natural resources used to produce electricity.
Advocacy groups	Non-governmental groups dedicated to protect the environment, e.g. Greenpeace. They can exert pressure, pointing flaws in company's performance to governmental agencies	• Corporate Relations	Direct communication, through exchange of information, with Canada's stakeholders.	A mechanism to include them into the loop should be considered

Stakeholder	Requirement	Area	Communication	Observations
Customers	All the users of electrical power in the province, regardless they have a contractual agreement with the company or not. All customers that have contractual agreements with the corporation for provision of electrical power and related services.	• Customer Service and Marketing • Corporate Relations	Regular communication. Some surveys are performed to know the perception of customers about company's performance	Customer feedback from surveys and other methods seems to be lacking of continuity to reach top management, thus impacting in the CSP and other strategies. Surveys are also not analyzed and performed in a regular basis.
Suppliers	Any entity that provides resources for the organization process, including • infrastructure, • engineering design support • equipment, • raw materials • technical & • technological information • other services	• All five Business Units • Procurement in Corporate Relations • Engineering Design for large projects in generation, transmission or distribution infrastructure.	Information exchange New or modified designs for facilities and infrastructure delivered for Engineering Design	Share quality objectives such as those set for reliability and quality of product. Set ISO 9001 registration, or similar, as requirement for key suppliers Partnership is essential with subcontractors (Design and building of infrastructure) and key suppliers
Employees	People working directly for the company and in payroll. They require a safe, stable, well-paid job that contributes to their well-being	• Human resources (from every BU and from Corporate Relations) • Middle and top management • Top management	Exchange of information Motivation and empowerment Involvement in decision making	Currently, employees' surveys are performed but not included for analysis and use for strategies. Employee Satisfaction index is not included in the CSP (Other than diversity of workforce)
Government	Provincial and Federal agencies related to contractual customer requirements, • regulating product (electrical power) specifications and • commercial transactions	• Engineering • Customer Service & Marketing • Corporate Relations • Finance and Administration (IT Support)	Legal channels	Government requirements are but not limited to Licenses and permits to generate, transmit and distribute electrical power Complaints from commercial transactions before governmental agencies (BBB and similar)
Community	The entire province and Canada in general are considered the local community, requiring a service that satisfies the customers			
Environment	Not Applicable			
Advocacy groups	Not Applicable			

Appendix F-2

CCB IMS – Resources

FIRST CYCLE – ENHANCING ENVIRONMENT DIMENSION		
RESOURCE	**DESCRIPTION**	**SOURCE**
HUMAN RESOURCE Employees in all Business Units: • Corporate Relations • Power Supply • Transmission & Distribution • Customer Service & Marketing • Finance & Administration	• There is no need for additional employees. • Training and awareness of employees in environmental issues may be an option to build the foundation for the IMS • Management skills and competencies are constructed around processes and stakeholders	• Employees • Consultants • Government • Schools and Universities • Advocacy groups
INFORMATION Requirements of Stakeholders and organization	• Regulation on environmental impacts of the operations to generate, transmit, distribute and maintain of electricity to the population of the province. The regulations included are those applicable to water quality, air emissions, land, water management, vegetation, and wildlife • Alternatives for improve efficiency on the generation and transmission of electricity of current facilities and transmitting grid	• Government (Environmental Protection Act) • Advocacy groups (CAE, Greenpeace) • Community in general • Employees • Suppliers • Costumers
Power generation technology	• Alternatives for saving energy and better use of electricity by customers • Available information for environmental assessment of the myriad of aspects that a large operation like the generation of electricity has	
Technology for transmission & distribution of electricity	• Latest developments on technology, materials and processes in generation, transmission and distribution of electricity to increase its efficiency and reliability	
Energy saving technology available to customers	• Latest development in alternative methods to generate electricity, e.g. wind turbines	
INFORMATION TECHNOLOGY Integral information systems	Ensure compatibility between different information management systems to share information and communicate among themselves and, if possible, consider interchange information directly from suppliers and government to include information of: • on environmental regulation, contractual and voluntary agreements • technology to decrease negative environmental impacts • levels of environmental performance of the company from generation to decommissioning	• Government, provincial and federal • Employees • Suppliers • Customers
EQUIPMENT Generation equipment such as turbines, transformers, power controls Testing equipment Hardware and Software for designing new hydroelectric stations	Old equipment utilized to produce and get ready electricity to be transmitted should be modernized to achieve minimum levels of reliability and efficiency. Auxiliary equipment should be installed to reduce the negative effect on water quality and levels of water affecting wildlife, vegetation, land and wildlife	• Suppliers • Employees • Other Utilities • Associations (CEA)

SECOND CYCLE – INCLUDING QUALITY DIMENSION

HUMAN RESOURCE Employees in all Business Units: • Corporate Relations • Power Supply • Transmission & Distribution • Customer Service & Marketing • Finance & Administration	• There is no need for additional employees. • Training in quality system, including specific concepts and methods is suggested to provide more emphasis on quality issues as part of the processes and overall management system.	• Employees (Main provider) • Top management (Coordination and leadership)
INFORMATION Requirements of Stakeholders and organization	• Customer Satisfaction levels • Profitability, ROI and finance rates • Reliability, power quality and other internal quality objectives • **Response to emergency situations of customer and suppliers, e.g. facility shot downs or extreme environmental situations - New!**	• Customers (Main provider) • Canadian Electric Association (CEA) • Suppliers • Employees
Power generation technology Technology for transmission & distribution of electricity	Available and potential technology for generation of power through renewable resources as well as for transmitting and distributing such power. Up-to-date information about • Efficiency of generating systems and equipment • Levels of performance expected (yield) • Levels of reliability of resulting wafers • Expected costs (fixed and variables) • Limitations of the processes • **Potential technology advancements**	• Suppliers (Main provider) • Employees • Customers
INFORMATION TECHNOLOGY Engineering Design Information systems Power Supply information systems Corporate Information systems	• Information systems designed to storage, handle, share, analyze and manage information and records for new projects and feedback from internal customers • **The corporation does have a number of information systems in place, differing according to their function. However, for integration purpose is suggested to integrate them or make them more compatible using an ERP, e.g. SAP, as core system. This integration will help in elimination of duplication of information, misunderstandings and lack of use of previous knowledge and experience**	• Employees (Main Provider) • Suppliers on IT • Internal customers
EQUIPMENT • Equipment for power generation and control • Quality and reliability testing	• Equipment to generate power such as hydro turbines, wind turbines, transformers • Equipment to test and control reliability and quality o the generated power	• Suppliers (Main provider) • Employees
IT Equipment for • Engineering design • Project management • Quality and reliability testing	• Computing equipment, including both hardware and software, for designing, simulating and testing the new facilities and equipment • Computing equipment for managing information of specifications, designs, purchase orders, work in progress, construction and delivery to asset owner	• Suppliers (Main provider) • Employees

SECOND CYCLE – INCLUDING QUALITY DIMENSION

RESOURCE	DESCRIPTION	SOURCE
INFRASTRUCTURE		
d) buildings, workspace and associated utilities	• The corporation already possesses sufficient buildings and workplaces for productive and supportive processes. They have all associated utilities, i.e. power, heating, Internet connection, telephone, etc.	• The province since it is a public utility
e) process equipment, both hardware and software	• Mentioned in previous aspect	
f) supporting services such as transport or communication	• Transportation and communication means are also available	
ENVIRONMENTAL HEALTH		
• Environmental conditions in the workplace and surroundings	• The headquarters (capital of the province) is mainly office buildings with few environmental aspects to take care of to provide a well-suited working environment. A smoke free environment may be enforced in all buildings to comply with this requirement • The power generation stations (built along the province) does have a sound safety management system in place, which also embraces the environmental conditions affecting workers in the workplace	• Employees • Suppliers
OCCUPATIONAL SAFETY		
• Conditions in the workplace	• See Environmental Health aspect.	• Employees • Suppliers

Appendix F-3

CCB IMS – Modification of Processes

PROCESS BUILDING POWER GENERATION FACILITIE		FIRST CYCLE ENHANCING ENVIRONMENT	
Sub - Processes	**Modification/Inclusion**	**IMS Requirement**	
Project Planning	**Inclusion – (All stages)** Environmental impacts of the construction and operation of new facilities should be validated by the engineering design team and by the asset owner before approved and proceeds to the operative phase.	7.5.6.7	Validation of processes for production and services provision
Implementation			
	Minor Inclusion – (Project Planning and Implementation) Traceability of the equipment and construction of infrastructure is used for environmental concerns when potential nonconformities can impact a negative impact on the environment, e.g. use of harmful materials in the construction of dams, tails or other infrastructure that can contaminate the water.	7.5.6.8	Identification and traceability
	Not applicable to this process	7.5.6.9	Stakeholders property
	Not applicable to this process	6.2.2.5	Preservation of product
	Inclusion – (Implementation and Closure) The corporation should control the appropriateness and quality of devices used to measure environmental aspects such as air emissions, chemicals release and soil content in new reservoirs.	7.5.6.10	Control of manufacturing and measuring devices
	Inclusion – (Implementation and Closure) Activities for measuring, analyzing and improving the environmental performance of the new facility and its construction process as part of the specifications and requirements set by the asset owner. Levels of water quality and water management, disturbance on wildlife and land management for construction facilities are some of the environmental aspects to take care of.	6.3.8	Measuring, analysis and improvement processes
	Major inclusion – (Implementation and Closure) Each project is monitored and its progress measured against a specific, integral set of objectives, which also consider environmental aspects (See environmental matrix).	6.3.9	Monitoring and measurement of processes
	Major inclusion – (Implementation and Closure) Each facility is monitored and its performance measured in testing situations and again in real conditions of operation to verify associated environmental aspects such as water quality, levels of water and wildlife conditions.	6.3.10	Monitoring and measurement of product
	Inclusion – (BEP, Project Planning and Implementation) When a specific design or element in the new facility does not conform to the specifications for environmental performance, the Corporation should identify and modify such element, e.g. a harmful material in the surface of a dam, to comply with planned objectives.	6.3.4	Control of non conforming product

PROCESS BUILDING POWER GENERATION FACILITIE		FIRST CYCLE ENHANCING ENVIRONMENT
Sub - Processes	**Modification/Inclusion**	**IMS Requirement**
Implementation & Closure	**Applicable only if The Corporation considers integrate social and ethical issues into the IMS**	6.3.11 Report for social and ethical issues
	Major inclusion – (Implementation and Closure) Measure levels of performance regarding to objectives for environmental impacts in the designed power generation facility, looking for deviations and variations outside of desired levels.	6.3.12 Analysis of Data
	Performed in step 12 of the IMS Implementation Methodology (Auditing)	6.3.13 Assessment Processes
	Inclusion – (Closure and Implementation) During the four stages of the processes, the asset owner and the Design Engineering Team should include environmental objectives in the review of progress of the project before delivering to the operations area.	6.3.14 Management Review
	Inclusion – (BEP; Project Planning and Implementation) The Corporation's objectives set in the CSP and those particular to Power Supply and Design Engineering should consider minimum levels of environmental performance in • The construction and • The operation of power generation stations both hydro and fossil-powered Control and improvement activities are implemented to reach such objectives.	6.3.14.1 Continual improvement
	Inclusion – (Implementation and Closure) When levels of minimum environmental performance in the design and construction of new power generating facilities are below objectives, the Corporation should implement actions to correct such gap. For example, changes in design, use of substitute materials and equipment to manage water and generate power. These actions should be recorded in the "lessons learned" database	6.3.14.2 Corrective action
	Inclusion – (Implementation and Closure) Environmental aspects are included in preventive activities, based on stakeholders' requirements and development of regulations. For example, the Corporation will update, in a regular basis, the database of environmental regulations associated to each environmental aspect associated to the design and construction of new facilities. Technology development and innovations are also included in such database	Preventive action

PROCESS **BUILDING POWER GENERATION FACILITIE**		**SECOND CYCLE** **INCLUDING QUALITY**	
Sub - Processes	**Modification/Inclusion**	**IMS Requirement**	
Business Enterprise Planning (BEP) Project Planning	**Major modification – (BEP and Project Planning)** The Corporation should include quality objectives for design and construction of new facilities such as capacity of generation, features of the electricity delivered, reliability of the equipment, maintainability, efficiency The New facility concept and design should be derived from future needs of energy and better use of renewable resources. Each of these sub-processes should undergo for activities of verification, validation and associated changes to meet the quality objectives of the process (Design and Construction) and the product (The final new generating station delivered to the asset owner)	6.2.1.13 6.2.1.14 6.2.1.15 6.2.1.16 6.2.1.17 6.2.1.18 6.2.1.7	Functional aspects D & D inputs D & D outputs D & D reviews D & D verification D & D validation D & D changes
Project Planning & Implementation	**Emphasis – (Project Planning)** Key suppliers such as vendors of generation equipment and EPC subcontractors) should be involved from the beginning of the project. This involvement should include partnership in innovations and better methods to generate energy. Also, their capability to work in a concurrent engineering approach is considered	6.2.2.8	Supplier involvement
	Minor modification – (Project Planning and Implementation) Middle critical parts and services should be better managed to avoid reworks and non-conforming parts	6.2.2.9	Purchasing information
	Minor modification – (Project Planning and Implementation) The control of larger projects is done in a reactive basis. This approach should be changed to a more proactive one where the estimations and actual progress indicate possible trends, visualizing potential sources of variation.	6.2.2.10	Control of purchased product
	Major Modification – (Project Planning). Emergency preparedness and response is considered by the Corporation only for health and safety and environmental aspects. For this specific process, the Corporation should design, maintain and implement specific procedures in the event of events that may affect the continuity, reliability and quality of the construction of power generating facilities. For instance, events such as land sliding, extreme rain or unforeseen harmful materials in reservoirs locations must be analyzed and procedures developed.	6.2.3.7	Control of product and service provision
	None. Validation is done by the Design Engineering Team and the Asset Owner	6.2.3.8 6.2.3.9	Emergency preparedness and response Validation of processes for production and services provision
	Emphasis – (Implementation) Key components of the equipment and of the infrastructure used for the new facility should be identified for traceability of potential non-conformities.	6.2.3.10	Identification and traceability

PROCESS **BUILDING POWER GENERATION FACILITIE**		**SECOND CYCLE** **INCLUDING QUALITY**
Sub - Processes	**Modification/Inclusion**	**IMS Requirement**
Project Planning Implementation Closure	**None**	6.2.3.11 Stakeholders property
	Major emphasis – (Implementation) The designs, specifications, diagrams, simulations, manuals of operation and maintainability along with the entire facility should be identified, handled, storage and protected until delivered to the corresponding Asset Owner.	6.2.3.12 Preservation of product
	Emphasis – (Implementation) Require a strict control and calibration of measuring devices from the EPC subcontractors as well as from the Design Engineering and other areas of the Corporation in charge of validation and approval of the project. For instance, testing equipment of turbines, transformer, relays banks should be controlled	6.2.3.13 Control of manufacturing and measuring devices
	Emphasis – (Implementation and Closure) Each project should be monitored and measured against its objectives of quality, cost and time. Each component and the whole new generating system should be tested and measured to verify the output in terms of quality and reliability	6.3.10 Measuring, analysis and improvement processes 6.3.11 Monitoring and measurement of processes 6.3.12 Monitoring and measurement of product
	Emphasis – (Implementation) Equipment and infrastructure out of specifications should be identified and separated from the operative processes. Information should be provided to suppliers when the nonconforming equipment or service is purchased.	6.3.13 Control of non conforming product
	Applicable only if The Corporation considers integrate social and ethical issues into the IMS	6.3.14 Report for social and ethical issues
	Emphasis – (Implementation and Closure) Measure levels of customer satisfaction (the asset owner and operations personnel) of previous generating facilities. Aspects to analyze are; reliability of the system, maintainability, quality of the outcome, efficiency of production, etc. Measure levels of employee satisfaction (Design Engineering) and, if possible, feedback from key equipment suppliers and subcontractors, analyzing the data to identify gaps in performance, opportunities for improvement and their impact on employee satisfaction and on the overall IMS performance	6.3.15 Analysis of Data
	Performed in step 12 of the IMS Implementation Methodology (Auditing)	6.3.16 Assessment Processes

PROCESS **BUILDING POWER GENERATION FACILITIE**		**SECOND CYCLE** **INCLUDING QUALITY**
Sub - Processes	**Modification/Inclusion**	**IMS Requirement**
Project Planning Implementation	**Inclusion – (Closure and Implementation)** During the four stages of the processes, the asset owner and the Design Engineering Team should include quality and environmental objectives in the review of progress of the project before delivering to the operations area.	6.3.17 Management Review
Closure	**Inclusion – (BEP; Project Planning and Implementation)** The Corporation's objectives set in the CSP and those particularly related to Power Supply and Design Engineering areas should consider minimum levels of quality and reliability in addition to the environmental performance in • The construction and • The operation of power generation stations both hydro and fossil-powered Control and improvement activities are implemented to reach such objectives.	6.3.18 Control and improvement
	Inclusion – (Implementation and Closure) When levels of defects or out-of-the-program conditions appear, the Corporation should implement actions to correct such gap. For example, changes in design, use of substitute materials and equipment to manage water and generate power. These actions should be recorded in the "lessons learned" database	6.3.18.1 Continual improvement
	Inclusion – (Implementation and Closure) From monitoring and measurement of project progress, out of specification equipment or infrastructure may be identified. To correct them, specific actions should be planned, implemented and measured. For instance, if a turbine does not generate the amount of power as set in the vendor specifications, it is returned to the vendor for replacement. These corrective actions should be recorded also in the "lessons learned" database	6.3.18.2 Corrective action
	Inclusion – (Implementation and Closure) Quality aspects are included in preventive activities, based on stakeholders' requirements and development of regulations. For example, the Corporation should be engaged in partnership with vendors to promote and use new technology that offer better levels of reliability and quality to generate electricity from renewable sources such as water and wind.	6.3.10.1 Preventive action

Appendix F-4

CCB IMS – Auditing Requirements

AUDITING CCB IMS		
ELEMENTS	**FIRST CYCLE**	**SECOND CYCLE**
	AUDITING PROCESSES	
General elements	• This audit is feasible if the company possesses the participation of environmentally trained auditors as well as the full participation and transparency from suppliers, i.e. semiconductor manufacturers • However, auditors should be trained in the system and process approach to audit an enhanced EMS • When auditing Design Engineering process, key suppliers and vendors, employees and Power Supply operative area are strongly involved	• The likelihood of having a suitable audit is high given the scope of the IMS at this time. Environmental requirements will have the addition of quality related. • When auditing Design Engineering process, key suppliers and vendors, employees and Power Supply operative area are strongly involved
Initiating the audit	• The audit is prepared directly under the Corporate EMS responsible. Internal auditing prepares the general plan. Key suppliers and vendors are included in the audit to provide information on control of environmental aspects.	• The system is prepared under the responsibility of the IMS management representative. Internal auditing prepares the audit plan. Key suppliers and vendors are included in the audit to provide information on the control of environmental and quality aspects
	• Audit quality objectives include indicators for completeness in addition to the normal environmental objectives such as compliance with regulations and existence of EMS elements	• Audit quality objectives are set, which should include quality, environmental and completeness of the system. Reliability, delivery and completion of follow up actions are also indicators to measure such audit quality
	• Inclusion of technical oriented employees as part of the auditing team to assess environmental side of the Corporation IMS	• Same
	• The IMS guidelines (Appendix A-5) are set to include solely Environmental issues as the criteria for this first system-wide audit	• The IMS guidelines (Appendix A-5) are broadened from the first cycle scope to incorporate Quality issues as the audit criteria
	• Personnel can be included as observers in supplier's management system audit, which is performed by supplier's personnel, e.g. vegetation management done by a subcontractor	• Personnel to take part on the inclusion of quality issues into the IMS can be included here as observers so they can know the organization's particular characteristics
	• Work documents are prepared to gather the information required	• Work documents are prepared to gather the information required
	• Documents to be reviewed includes Management System Manual and relevant procedures and records specified in IMS guidelines as well as corporative specific needs	• All of the first cycle plus those related to quality and reliability aspects of the system
Implementing and operating	• Resources such as infrastructure and IT systems are provided by top management. These resources can be taken directly from the recently achieved IMS	• Resources in terms of infrastructure and IT systems are provided by the executive team. These resources can be taken from the IMS itself
	• The audit is performed according to the plan, collecting and verifying information on the system. Special issues to look at are:	• The audit is performed according to the plan, collecting and verifying information on the system. Particular emphasis is put in:

AUDITING CCB IMS

ELEMENTS	FIRST CYCLE	SECOND CYCLE
IMS Leadership element	• Setting of environmentally oriented objectives for the CCB • Implementation of processes and programs through provision of resources. • Also each member of top management should have environmental components in its performance indicators	• Setting of quality oriented objectives for the CCB • Implementation of processes and programs for quality through provision of resources. • Also each member of top management should have environmental components in its performance indicators. • Perception from employees of the overall leadership
IMS Stakeholders	Existence of processes to identify, update and, if possible, anticipate the stakeholders' requirements. Due to the broad range of environmental impacts of the Corporation activities, environmental stakeholders to be included should include governmental agencies, NGOs, universities and research centers, employees and community in general.	Involvement of suppliers, e.g. vendors and subcontractors, and customers in setting and operating customer-focused processes Verify that information from stakeholders is gathered, updated and included in the decision making process
IMS Values and Objectives	Employees knowledge on • The CCB values and their application in daily operations, • Environmentally oriented objectives • Trade offs in objectives Also they have to be properly deployed to specific areas and processes	Employees knowledge on • The CCB values and their application in daily operations, • Existence of quality and customer-oriented objectives • Trade offs in objectives including environmental and quality components Also they have to be properly deployed to specific areas and processes
IMS Resources	Training and follow up on IMS elements. Rewards, recognitions and promotions for employees duly tied up with IMS objectives	
IMS Processes	Addition of new requirements to the normal ISO 14001-based EMS (Process approach, design inclusion, manual for the system) Inclusion of environmental impacts, other than emission of greenhouse gases, from the designing the generation station and associated infrastructure for T&D to customer service	Integration of such processes of requirements focused to improve and maintain customer satisfaction, including new requirements to the normal ISO 9001 (Supplier involvement, emergency preparedness and response)
IMS Results	Measurement of IMS results and their inclusion as input to the CCB quarterly reviews of IMS objectives, i.e. Power generation, T&D and Customer Service	
	• A report is prepared, approved and distributed as described in auditing guidelines (Appendix D-3).	• Audit work documents should be identified and codified to maintain traceability • A report is prepared, approved and distributed as described in auditing guidelines (Appendix D-3). •

AUDITING CCB IMS

ELEMENTS	FIRST CYCLE	SECOND CYCLE
	AUDITING RESULTS	
Special emphasis should be done in:		
	• Alignment of company's processes and related objectives of customers and the provincial development strategies • Non conformances found in the IMS operations • Follow up actions suggested, performed and final results achieved • Level of balance and proper weight of quality and environmental objectives	
Controlling and Improving	• The audit team leader (Internal auditing/Registrar team leader) monitors and measures the performance of the audit and team auditors Audit quality is also monitored and measured. If gaps or underperformance are identified, corrective actions should be performed, i.e. reevaluation of evidence, training of auditors	
	The CCB would establish the following indicators to control the quality of its audits: • Reliability of audit findings: judgment of consistency of work documents • Level of materiality on findings: Judgment of issues audited and the importance to the company performance • Percentage of Non conformance actions completed within time	
		Balance and completeness. Verify both quality and environmental aspects of the system